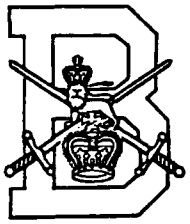
MERICAN



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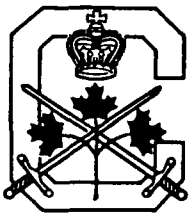

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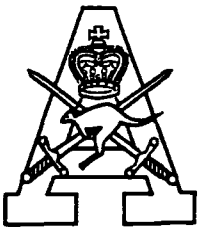
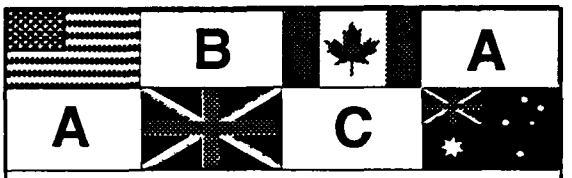


USTRALIAN



QUADRIPARTITE
ADVISORY
PUBLICATION - 59
EDITION 5
(AUGUST 1992)

ARMIES
STANDARDIZATION PROGRAM

CATALOG OF WAR GAMES

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

2

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Catalog of War Games

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DECLARATION OF ACCORD

1. PURPOSE

This catalog provides information on the primary war games, combat simulations and training games used by ABCA Armies to support Studies and Analyses or drive Command Post Exercises (CPXs) and Field Training Exercises (FTXs). It is intended to facilitate the exchange of information by describing here key features of current combat modeling techniques. More detailed documentation is available from the designated Point of Contact.

2. SCOPE

The types of combat models considered include both functional area models and force level models. Functional area models are primarily one-sided and focus on the detailed aspects of a particular battlefield functional system, such as the divisional field artillery system. Force level models are two-sided and attempt to represent all or most combined arms and support functions at a given echelon such as division and below. Force level models may be interactive with players performing various command, control, and staff functions or may be systemic (totally computerized) with algorithms used to simulate Command decision logic. Some interactive combat models (wargames) are used for research purposes to assess potential value of new tactics and new weapon systems and other interactive combat models (training games) are used to train Commanders or to drive field training exercises. Force level systemic models (combat simulations) are used typically to investigate weapon system alternatives or force structure tradeoffs when the number of cases of interest exceed the responsiveness capabilities of the slower research games.

3. ORGANIZATION

Table I contains an alphabetical index of combat models by acronym/title.

4. AMENDMENT

The contents of this QAP are to be revised when necessary by the contributing Armies, to reflect development in national practices and to maintain its currency.

5. USE

The information in this QAP should whenever possible be used

by Armies to improve the level of standardization or interoperability on primary war games, combat simulations and training games used by ABCA Armies.

6. RELEASE

A statement has been provided on the releasability of each model. It should be noted that the fact that a particular model is releasable does not imply that all requests for release will be approved. Each release will be judged on a case-by-case basis and may require compliance with appropriate configuration control procedures. Also, release to contractors may be prohibited.

FOR THE WASHINGTON STANDARDIZATION OFFICERS:

J V FIELDING
Colonel
Director
Primary Standardization Office

23 September 1992

TABLE I. ALPHABETICAL INDEX OF COMBAT MODELS.

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TITLE: Achieving a System Operational Availability Requirement (ASOAR) Version 3

DATE IMPLEMENTED: 1991.

MODEL TYPE: Analysis.

PROPONENT: USA CECOM, Attn: AMSEL-PL-SA, Ft. Monmouth, NJ 07703-5027.

POINT OF CONTACT: Mr. Bernard Price, DSN 992-8752 or (908) 532-8752.

PURPOSE: Research and Evaluation Tool dealing with Weapon Systems in Systems Development and as an Operations Support tool (Decision Aid). ASOAR cost effectively prorates a weapon system operational availability requirement to end item operational availability goals. It determines the degree of supportability necessary to achieve each operational availability goal. It also determines the effective reliability and maintainability of the system and effective reliability of redundant configurations.

DESCRIPTION:

Domain: Applicable to all weapon systems.

Span: N/A.

Environment: N/A.

Force Composition: N/A.

Scope of Conflict: N/A.

Mission Area: Weapon system operational availability and reliability analysis, and logistics supportability analysis.

Level of Detail of Processes and Entities: Primary End items of Government Furnished Equipment of weapon system is the lowest entity modeled.

CONSTRUCTION:

Human Participation: Required to determine configuration of the weapon system and its support concept.

Time Processing: Static

Treatment of Randomness: Deterministic.

Sidedness: One-sided.

LIMITATIONS: Analyzes one weapon system at a time.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Development of user's manual for Version 3.

INPUT:
- o System Operational Availability
- o Reliability Block Configuration of end items
- o Mean Time to obtain (MTTO) LRU spares
- o End item Mean Calendar Time Between Failure (MCTBF)
- o End item Mean Restoral Time (MRT)
- o End item cost estimates

More inputs are requested if MTTO of LRUs are computed from supply & maintenance concept; scheduled maintenance/down time exists; multiple systems share forward level spares; or end item commonality or redundancy exists.

OUTPUT:
- o Whether the system design and support plan can achieve the system operational availability requirement
- o System MCTBF and system MRT
- o Optimal operational availability for each end item
- o Effective MCTBF of each redundant configuration based on achieving its availability goal
- o Mean Logistics Down Time and LRU Order Fill Rate at the most forward supply level to achieve each availability goal

HARDWARE AND SOFTWARE:

Computer: Zenith PC (or compatible PC) with MS-DOS 3.2 or higher.

Storage: 300k bytes needed not including data base.

Peripherals: Minimum Requirements: monitor; Optional: Printer.

Programming Language: FORTRAN IV.

Documentation: ASOAR Model, AORS XXIX, page 53-56, Oct 90.
ASOAR Methodology, Jun 91
ASOAR Version 2 Users Manual, Dec 90

SECURITY CLASSIFICATION: Model without data is UNCLASSIFIED.

GENERAL DATA:

Data Base: Can be prepared in minutes.

CPU Time per Cycle: N/A.

Data Output Analysis: Analyst quality review of output appearing on monitor or printout.

Frequency of Use: Model distribution just started.

Users: Currently Army Communications-Electronics Command (CECOM).

Comments: ASOAR Version 3 will be completed and documented by Jun 92. Its executable code disk and documentation will be made available upon request.

TITLE: Air Defense Computer Modeling System - COMO III

DATE IMPLEMENTED: 1986.

MODEL TYPE: Analysis.

PROPONENT: Systems and Cost Analysis Directorate, U.S. Army Missile Command, Redstone Arsenal, AL 35898-5060.

POINT OF CONTACT: Charles E. Colvin, DSN 746-3904/(205) 876-3904.

PURPOSE: COMO III is a general-purpose critical event modeling system designed for the writing and development of air defense simulations. It is used to evaluate the operational effectiveness of air defense weapon systems in a realistic tactical scenario. COMO III is used as a research and development tool and an operations support tool.

DESCRIPTION:

Domain: Land and air.

Span: Theater, corps, division, battalion, individual fire unit.

Environment: Electronic battlefield, digitized terrain, meteorological visibility.

Force Composition: Mix of land-based air defense weapon systems and mix of attacking airborne threat and tactical missiles.

Scope of Conflict: Conventional.

Mission Area: All conventional missions of an attacking airborne threat and tactical missiles.

Level of Detail of Processes and Entities: Single aircraft, tactical missile or air defense fire unit.

CONSTRUCTION:

Human Participation: Required for decisions and processes.

Time Processing: Event-step with some time-step events.

Treatment of Randomness: Stochastic using both direct and Monte Carlo computation.

Sidedness: Two-sided, asymmetric with one side nonreactive.

LIMITATIONS: Initial setup of game requires large number of labor hours, excessive CPU hours for large-scale scenario, reactive and smart ECM not played, and wild-weasel tactics not simulated for aircraft.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Real-time battlefield graphics display package.

INPUT: Tactical scenario, weapon characteristics, ECM, weather effects, fire unit deployment, firing doctrine, rules of engagement, and defended ground assets.

OUTPUT: Computer printouts, plots, raw data, event-by-event summary, multiple replication statistics, and kill summaries.

HARDWARE AND SOFTWARE:
Computer: CDC 7000 series, CYBER 74, VAX 11/700 series, DEC MicroVAX, DEC 8000 series, GOULD, HP 9000, UNIVAC, Silicon Graphics.
Storage: 160K octal for nonvirtual memory computer.
Peripherals: 1 VT100 terminal and 1 high-speed printer.
Language: FORTRAN 77.
Documentation: Fully documented.

SECURITY CLASSIFICATION: UNCLASSIFIED, but data bases are often classified.

GENERAL DATA:
Data Base: Minimum 0.5 man-year, maximum 6 man-years.

CPU Time per Cycle: Variable.

Data Output Analysis: Variable depending on level of expertise of analysts.

Frequency of Use: Continuously.

Users: TRADOC, MICOM, CAA, AMSAA, USA MSIC, numerous contractors.

Comments: COMO III is managed by the MICOM COMO Model Management Board.

TITLE: AIR DEFENSE SIMULATION SYSTEM (ADSS)

DATE IMPLEMENTED: 10/29/90

MODEL TYPE: Analysis - Stochastic, discrete event functional area combat model of air defense.

PROPONENT: Concepts & Studies Division, Combat Developments Directorate, US Army Air Defense Artillery School, Ft. Bliss, TX

POINT OF CONTACT: Mr. Luis Alvarez, USAADASCH, ATSA-CDC-M, Ft Bliss, TX, (915) 568-1233; Dr. Carol Burleson, COLSA, Inc. (915) 779-5899.

PURPOSE: Analysis of the combat effectiveness of air defense systems, tactics, and doctrine; and development of air defense scenarios and laydowns over terrain.

DESCRIPTION: The ADSS Model computerized, two-sided, systemic, stochastic model for the analysis of air defense weapon effectiveness and air defense tactics, doctrine, and employment/deployment. The model is data-driven and allows existing, improved, developmental, and conceptual air defense systems to be simulated by placing sensors, weapons, and munitions with a variety of characteristics on platforms. Either side may use any system characteristics, tactics, doctrine, and decision rules which the model can simulate. ADSS attrits and models the functions of individual sensors, weapons, and rounds. It is designed for rapid, user-frendly setup: all input files other than terrain are in ASCII free format. Scenario sizes range from one-on-one to division or corps slice. The ADSS Model is written in SIMSCRIPT II.5 and FORTRAN and is run without user interference. It may be executed in batch mode. The color graphics preprocessor can be used to develop flight and ground movement profiles and laydowns for weapons, sensors, and defended assets over terrain display with elevations and feature overlays. Scenario files can be ported directly to the model as input. The code is written in the C language interactive, and uses hierarchies of menus. Features include:
- dynamic line-of-sight on DTED Level I terrain with DFAD feature overlays for foliage and obstacles
- ground movement by AD systems and defended assets
- ground-to-air and air-to-ground engagement
- decision rules for target selection, engagement decisions, and ROE
- dynamic acquisition using integrated CNVEO (NVEOL) VISPOE models

CONSTRUCTION: ADSS was originally developed as a model for FAADS weapons and sensors by COLSA, Inc., El Paso, TX and delivered to DCD, USAADASCH, in 1988. The simulation model was then called ADAsim (Air Defense Artiller Simulation) and was written in ghe General Simulation System (GSS) simulation environment. In 1989, COLSA completely rewrote the simulation model as an internal IR&D project and delivered the resulting model to DCD. The ADSS Model is now a generic, data-driven air defense model in SIMSCRIPT II.5. The preprocessor, which runs on a Silicon Graphics Iris 3000 series Workstation, was modified for consistency with the model. The postprocessor, originally in SPSS, is being rewritten in FORTRAN. COLSA maintains the ADSS and provides configuration management for the current ADSS model, preprocessor, and postprocessor under contract with DCD, USAADASCH. ADAsim (GSS) and the postprocessor in SPSS are maintained by DCD, USAADASCH and are no longer supported by COLSA.

LIMITATIONS: Runs only on Silicon Graphics 3000 Series Workstations;

Does not move entities on the terrain during scenario development; Run and setup time highly scenario dependent; flight profiles must be preprocessed.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Ground-to-air ID module: IFF, ASM, ROE, NCTR; Dynamic ECM-broadband jamming; New flightpath generator based on BLUEMAX and HELIPAC from SURVIAC; New statistical postprocessor.

INPUT: Material characteristics: Radar detection param; RF emitter and detector param (IFF, ESM, etc.); Optical/electro-optical sensor param; Weapon characteristics; Platform dimensions & velocities; Munition flyout data; Jammer param.
Threat & friendly munition lethalities vs aircraft & ground target types
Round-target matrix
Scenario files

OUTPUT: For each replication: Event histories for selected vehicles, side event types
For single or multiple replications: Detection, tracking, engagement, damage, and attrition means and range histograms vs target, weapon, sensor, and round types

HARDWARE AND SOFTWARE:

COMPUTER (OS): ADSS Model and Postprocessor- VAX VMS; Preprocessor- Silicon Graphics Iris 3000 Workstation under UNIX.

STORAGE: Currently running on DEC VAX 3600 with 16 Mb virtual memory and 622 Mb disk; Silicon Graphics Workstations have two 180 Mb disks.

PROGRAMMING LANGUAGE: Model and Postprocessor- SIMSCRIPT II.5 and FORTRAN; Preprocessor- C and SG 3000 GL (C-based)

DOCUMENTATION: User Manual (input file and element descriptions); Technical Manual; Executive Summary; Preprocessor Manual; and Postprocessor Manual

OTHER COMMENTS: Large terrain data files may result in unacceptably long model execution times during interaction with preprocessor.

SECURITY CLASSIFICATION: All code is unclassified. Databases may be classified if systems can be identified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Time required for 2 deg by 2 deg input file averages 3-4 hours of elapsed time on equipment described above (varies with density)

CPU TIME PER CYCLE: 1-5 minutes per cycle on the VAX with a dedicated system and FAADS platoon level scenarios with less than 20 aircraft.

DATA OUTPUT ANALYSIS: Highly dependent on the scenario and the analysis at hand. Output summary displays for each rep are easily compared

FREQUENCY OF USE: Two studies using the ADSS model are in progress at COLSA. Preprocessor is used on average of every 2 months for stand-alone

USERS: DCD, USAADASCH; COLSA, Inc.

COMMENTS: None

TITLE: Ammunition Point Simulation (APS)

DATE IMPLEMENTED: 03/01/88

MODEL TYPE: Analytical

PROPONENT: UA Army Ordnance Missile and Munitions Center & School (USAOMMCS), Redstone Arsenal, AL 35897

POINT OF CONTACT: Leon Jones, DSN: 746-8420

PURPOSE: To develop an analytical tool to examine the preferred way for operating ammunition supply points and similar ammunition installations.

DESCRIPTION: This is a stochastic, one-sided model with no combat play. Demands on the ammunition supply system are generated from external sources such as TRADOC Standard Scenarios. The model then assesses the best way to load the demand, construct convoys, and move the convoys to destination. Movement to destination is not terrain dependent but is included to show time during which trucks in convoy are not available for loading. Up to 132 convoys can be played.

CONSTRUCTION:
HUMAN PARTICIPATION: Not Permitted
TIME PROCESSING: Dynamic time step
SIDENESS: One-sided

LIMITATIONS: Requires extensive input

PLANNED IMPROVEMENTS AND MODIFICATIONS: None

INPUT: Organizaions
ASP layout and equipment
Time factors
Customer travel time

OUTPUT: Stockage status
Customer in ASP time
Queue data
MHE utilization

HARDWARE AND SOFTWARE:

COMPUTER (OS): IBM PC compatible /with math coprocessor MS-DOS

STORAGE: 20 MB

PERIPHERALS: Printer

PROGRAMMING LANGUAGE: Fortran77

DOCUMENTATION: Ammunition Point Simulation (ASP) User/programmer Manual (Books 1 & 2), Armament Systems, Inc., Feb 83

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 3 Hours for set up.

USERS: USAOMMCS

TITLE: Analysis of Force Potential DATE IMPLEMENTED: 1985

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency

POINT OF CONTACT: Barry Groves DSN: 295-5256, CM (301) 295-5256

PURPOSE: Quantify firepower potential of land combat forces of division size and larger for use in analysis of force levels and force ratios. Has been used primarily to analyze changes in total Army force potential attributable to force modernization. Has most recently been applied to analyze changes in force potential and force ratios associated with various proposed reductions in weapon procurement and U.S. and Soviet force size.

DESCRIPTION:

Domain: Land combat, limited close air support

Span: Division level combat

Environment: Models day and night combat and clear and degraded visibility in the full range of combat posture desired for a study.

Force Composition: Army

Scope of Conflict: Conventional

Mission Area: Direct fire battle, close air support, indirect artillery

Level of Detail of Processes and Entities: Models individual weapons in weapon-on-weapon engagements through processes of detection, direct fire, indirect artillery, and attrition.

CONSTRUCTION:

Human Participation: Not permitted, model not interruptible.

Time Processing: Static

Treatment of Randomness: Stochastic, Monte Carlo

Sidedness: Two-sided, symmetric

LIMITATIONS: Limited representation of terrain and logistical support.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Incorporation of representation of future/advanced weapon systems.

INPUTS: Unit weapon composition, probability of kill tables, sensor characteristics, scheme of weapon versus weapon engagement pairings, artillery lethalities, and detection criteria.

OUTPUTS: Attrition tables, combat potential values by weapon, and force scores, ATCAL importance values combat potential.

HARDWARE AND SOFTWARE:
Computer: Currently Unisys 1100 mainframe.
Storage: Currently 240,000 words.
Peripherals: Tape drive, line printer.
Programming Language: FORTRAN 77
Documentation: Operator's and Programmer's Guide to the Analysis of Force Potential System (AFPSYS). (out of date)

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA:
Time Requirements:

Data base: 3 months

CPU time per cycle: 50 minutes/run; multiple runs per study.

Data Output Analysis: 1-3 weeks.

Frequency of Use: 5-6 times per year

Users: U.S. Army Concepts Analysis Agency

Releasability: Releasable

TITLE: ARMORED BATTALION RECOVERY AND MAINTENANCE SIMULATION (ARMSIM) MODEL (ARMSIM)

DATE IMPLEMENTED: 08/15/90

MODEL TYPE: ANALYSIS

PROPONENT: U.S. ARMY ORDNANCE CENTER AND SCHOOL (USAOC&S), ABERDEEN PROVING GROUND (APG), MARYLAND 21005-5201

POINT OF CONTACT: MR BRICE, ATSL-CD-CS, DSN: 298-2028/2803 USAOC&S, APG, MARYLAND 21005-5201

PURPOSE: RESEARCH & EVALUATION, WEAPONS SYSTEMS, SYSTEMS DEVELOPMENT & EFFECTIVENESS, COMBAT DEVELOPMENT, CURRENT OR NEW DOCTRINE.

DESCRIPTION: LAND, LOCAL, TYPICAL EUROPEAN BATTLEFIELD, ARMORED BATTALION/BRIGADE, CONVENTIONAL & CHEMICAL, RECOVERY & MAINTENENCE DURING SIMULATED BATTLE, RELIABILITY FAILURE OR COMBAT DAMAGE REQUIRING RECOVERY OR MAINTENANCE.

CONSTRUCTION: HUMAN PARTICIPATION NOT REQUIRED, SCHEDULED CHANGES ARE PERMITTED, DYNAMIC, EVENT STEP, STOCHASTIC, MONTE CARLO, ONE SIDED.

LIMITATIONS: CURRENTLY LIMITED TO TANKS AND ARMORED MAINTENANCE VEHICLES. COULD EASILY BE EXPANDED, E.G., TO ADD BRADLEYS.

PLANNED IMPROVEMENTS AND MODIFICATIONS: PLAN TO ADD CAPABILITY TO MODEL MAINTENANCE AND RECOVERY CONCEPTS OF ALLIES.

INPUT: MEAN TIME BETWEEN FAILURES/KILLS, MEAN RECOVERY TIME, MEAN REPAIR TIME, OTHER PARAMETERS DESCRIBING THESE DISTRIBUTIONS, MAINTENANCE & RECOVERY CONCEPTS & PERFORMANCE FACTORS, DIMENSIONS OF THE BATTLEFIELD, VEHICLE SPEED.

OUTPUT: PRINTOUT OF TANK AVAILABILITY, LOSSES, & MAINTENANCE & RECOVERY WORK DAY. VIDEO ANIMATION OF THE SIMULATED RECOVERY & MAINTENANCE OPERATION. STANDARD SUMMARY REPORT WITH PLOTS AND STATISTICALLY ANALYZED DATA IS AVAILABLE.

HARDWARE AND SOFTWARE:

COMPUTER (OS): IBM COMPATIBLE 386 OR 286 MACHINE WITH DOS 3.0 OR HIGHER. WINDOWS 286 OR HIGHER.

STORAGE: 10 MB HARD DISK. 640 K RAM.

PERIPHERALS: EPSON FX COMPATIBLE PRINTER.

PROGRAMMING LANGUAGE: SLAMSYSTEM 1.0 OR HIGHER. FORTRAN 4.0 OR HIGHER.

DOCUMENTATION: SLAMSYSTEM USER'S GUIDE.

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: NO DATABASE

CPU TIME PER CYCLE: LESS THAN 1 MINUTE PER RUN, PLUS THE SPECIFIED ANIMATION TIME.

DATA OUTPUT ANALYSIS: NONE REQUIRED.

FREQUENCY OF USE: AS REQUIRED.

USERS: DIRECTORATE OF COMBAT DEVELOPMENTS, U.S.ARMY ORDNANCE CENTER & SCHOOL, APG, MD 21005-5201

TITLE: Army Training Battle Simulator System (ARTBASS) (ARTBASS)

DATE IMPLEMENTED: 12/01/89

MODEL TYPE: Training and Education

PROPONENT: U.S. Army Combined Arms Command - Training, ATIN: ATZL-CTS
FT. Leavenworth, KS 66027

POINT OF CONTACT: Mr. Bernard, DSN: 552-3189/5485
U.S. Army Combined Arms Command - Training, ATIN: ATZL-CST

PURPOSE: Through use of a real-time battle simulation and a computer graphics display system, a battalion commander and staff may exercise the command and control realities that they will encounter on the modern battlefield. ARTBASS permits a battalion commander to observe the staff responding to input normally received from suboordinate units in a tactical situation. It allows for alternate courses of action to be evaluated for effectiveness while stimulating the warfighting and decision making process.

DESCRIPTION:
DOMAIN: Land and air.
SPAN: Battalion.
ENVIRONMENT: Digitized terrain, 25 meter resolution.
FORCE COMPOSITON: Red and Blue units of joint or combined forces depending on the data base.
SCOPE OF CONFLICT: Conventional warfare.
MISSION AREAS: Conventional maneuver battalion mission areas.
LEVEL OF DETAIL OF PROCESSES AND ENTITIES: Individual weapon or soldier.

CONSTRUCTION:
HUMAN PARTICIPATION: Human participation required for decisions.
TIME PROCESSING: Dynamic, time-step.
TREATMENT OF RANDOMNESS: Stochastic, Monte Carlo.
SIDENESS: Two-sided, asmmetric.

LIMITATIONS: ARTBASS can model only 300 units.
Can play in any terrain after input terrain files are preprocessed.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None

INPUT: Order of battle, firing rates, kill probabilities, mobility, terrain, weather, specific unit orders, firing commands.

OUTPUT: Sides display of unit locations and battlefield control information. Real-time CRT output reports of unit battlefield activity. Summary listings over time describing status.

HARDWARE AND SOFTWARE:

COMPUTER (OS): Perkin Elmer.

STORAGE: 8 megabyte memory, 450 MB disk.

PERIPHERALS: Terminals, printers, tape, monitor.

PROGRAMMING LANGUAGE: FORTRAN.

DOCUMENTATION: Documentation available from CECOM, ARTBASS PDSS Team, FT. Leavenworth KS.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 1 week

CPU TIME PER CYCLE: Unknown.

DATA OUTPUT ANALYSIS: N/A

FREQUENCY OF USE: 250 times per year.

USERS: AC and RC combat battalions.

TITLE: BATTALION BRIGADE SIMULATION (BBS)

DATE IMPLEMENTED: 11/26/90

MODEL TYPE: TRAINING AND EDUCATION

PROPONENT: TRADOC ANALYSIS COMMAND (TRAC), OPERATIONS ANALYSIS CENTER (OAC) FORT LEAVENWORTH, KANSAS 66027-5200

POINT OF CONTACT: MR CANIWELL, DSN: 552-2098, TRAC-OAC, Fort Leavenworth, KS 66027-5200

PURPOSE: TO PROVIDE BATTALION AND BRIGADE COMMANDERS AND THEIR STAFFS AN ENVIRONMENT TO TRAIN IN THE EXECUTION OF AIRLAND BATTLE DOCTRINE AT THE TACTICAL LEVEL OF WAR. BBS IS USED PRIMARILY AS A COMMAND POST EXERCISE (CPX) DRIVER.

DESCRIPTION: BBS IS A SYSTEM OF COMPUTERS NETWORKED TOGETHER TO PROVIDE THE DRIVER FOR CPX OR COMMAND AND STAFF TRAINING. THE SIMULATION OPERATES AS A TWO-SIDED, FREE PLAY, REAL-TIME TRAINING ENVIRONMENT. THE SYSTEM PLAYS AIR AND GROUND WARFARE BETWEEN OPPOSING UNITS AND THE RESUPPLY, MEDICAL, AND MAINTENANCE REQUIRED TO SUPPORT THE CONFLICT. IT IS A HIGH RESOLUTION MODEL WHICH REPRESENTS WEAPON AND SUPPORT SYSTEMS AT THE ITEM LEVEL.

CONSTRUCTION: DISTRIBUTED PROCESSING AMONG UP TO 10 MICRO VAX COMPUTERS; VIDEO DISK TECHNOLOGY FOR TERRAIN REPRESENTATION; IEV GRAPHIC OVERLAY OF VIDEO DISPLAYED MAPS. PRESENTLY BEING REPLACED BY AMIGA GRAPHIC DRIVERS. THE SIMULATION IS A REAL-TIME, MAN-IN-THE-LOOP, FREE PLAY SYSTEM WHICH RESPONDS TO THE DESIRES OF COMMANDERS IN THE FIELD. INTERFACE TO THE MODEL IS THROUGH CONTROLLERS WHICH PLAY SUBORDINATE UNITS, THEREFORE MAKING THE SIMULATION TRANSPARENT TO THE TRAINING AUDIENCE.

LIMITATIONS: LIMITED TO PLAY TERRAIN TYPES AVAILABLE AS DIGITIZED DATA WITH VIDEO DISK DISPLAY

PLANNED IMPROVEMENTS AND MODIFICATIONS: MORE TERRAIN AREAS, AMIGA GRAPHICS, MULTI-STATIONS PER MICRO-VAX

INPUT: MOVEMENT/CONFLICT ORDERS, UNIT NAMES/LOCATIONS, RESUPPLY

OUTPUT: CONFLICT RESOLUTION, BATTLE DAMAGE, PERSONNEL AND LOGISTICS LOSSES, ALERTS, REPORTS, GRAPHIC BATTLE DEPICTION

HARDWARE AND SOFTWARE:

COMPUTER (OS): DIGITAL EQUIPMENT VAX/VMS

STORAGE: 2 HARD DRIVES OF 71 MEG EACH

PERIPHERALS: TERMINALS, PRINTERS, TV, IEV GRAPHICS PROCESSOR

PROGRAMMING LANGUAGE: MODULA-2

DOCUMENTATION: UNDER CONTROL FOR DELIVERABLE

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 1 WEEK

CPU TIME PER CYCLE: INTERACTIVE FREE PLAY

DATA OUTPUT ANALYSIS: N/A

FREQUENCY OF USE: 160 TIMES PER YEAR

USERS: BATTALION AND BRIGADE COMMAND AND STAFF

COMMENTS: BATTALION VERSION FIELDED; BRIGADE VERSION DUE JAN 91

TITLE: Battlefield Planning System (BPS)

DATE IMPLEMENTED: 10/24/90

MODEL TYPE: Analysis - an operations support tool.

PROPONENT: TRADOC Analysis Command-White Sands (TRAC-WSMR), White Sands, NM 88002-5502

POINT OF CONTACT: MAJ Bruce Robinson, TRAC-WSMR, DSN: 258-1012

PURPOSE: A decision aid to assist the mauever brigade and division staffs with the planning process.

DESCRIPTION: An automated decision aid that performs terrain analysis using digital terrain data, wargames courses of action through combat modeling, and produces operational documents such as orders and overlays to support the selected course of action.
Domain: Land and air.
Span: Local/regional.
Environment: Terrain relief and cultural features.
Force Composition: Component.
Scope of Conflict: Conventional.
Mission Area: Combined arms - ground, air, artillery.
Level of Detail: Individual weapons system to task force.

CONSTRUCTION:
Human Participation: Required for decisions and processes.
Time of Processing: Dynamic, time step.
Treatment of Randomness: Deterministic generating expected values - or stochastic based on Monte Carlo simulation.
Sidedness: Two sided and symmetric.

LIMITATIONS: Availability and detail of digital terrain data. Availability of weapons performance data.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None.

INPUT: Terrain, scenario, force composition.

OUTPUT: Computer graphics, computer printouts, raw data, statistically analyzed data.

HARDWARE AND SOFTWARE:

COMPUTER (OS): Hewlett-Packard 9000/300 series computer with UNIX operating system.

STORAGE: 15 Mb disc space, 4 Mb RAM required. Terrain data stored on cartridge tape.

PERIPHERALS: BW or color printer, mouse, high resolution color monitor, cartridge tape drive, large scale mechanical plotter.

PROGRAMMING LANGUAGE: Pascal and C.

DOCUMENTATION: User's manual and technical documentation.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Digital terrain data, weapons performance data, historical weather data.

CPU TIME PER CYCLE: Combat model: 5 min cpu time = 60 min battle time. Terrain analysis: Varies on whats being done.

DATA OUTPUT ANALYSIS: Combat model: Various measure of effectiveness data provided. Terrain analysis: User interprets output.

FREQUENCY OF USE: Depends on user.

USERS: CGSC, TRAC-WSMR, USMA, ETL, TEXCOM, HQ III Corps, 1st ID, 1st CD, 4th ID, 2nd AD, 3rd ACR, 35th ID, Engr School, PM-OPTADS.

COMMENTS: Model incorporated into Maneuver Control System (MCS). Proponency to passed off to PM-OPTADS nlt May 91.

TITLE: C3ISIM (C3ISIM)

DATE IMPLEMENTED: 10/30/90

MODEL TYPE: Analysis

PROPONENT: Directorate of Combat Developments, Concepts & Studies Division, US Army Air Defense Artillery School, Ft. Bliss, TX

POINT OF CONTACT: FRED LOHRMAN, USAADASCH, ATIN: ATSA-CDC-M, FT. BLISS, TX, 79916-0002

PURPOSE: C3ISIM is basically a many-on-many model designed to simulate the interaction of a multitude of C2 nodes, weapon systems, communications nodes, and intelligence sensors in an air defense and SRBM defense scenarios. It models both Blue and Red forces, and is designed to be graphics-based, user-oriented, highly versatile, and relatively low cost.

DESCRIPTION: C3ISIM is an effective and powerful tool for supporting the analysis of C3I systems and employment procedures. The arena of theater an tactical C3I has become enormously complex in recent years. With that complexity has come increasing difficulty in analyzing C3I system effectiveness, determining system impact on combat operations, and assessing the propriety of emerging operational concepts. C3ISIM helps both developers and potential users of new C3I systems to quickly, accurately, and inexpensively determine how well the design or specific employment of a system will fulfill operational requirements, by modeling the following functional areas:
- C2 processes through the use of rule-based decision making
- Combat engagements and many-on-many attrition in a dynamic, user-controled environment that fully exercises the C3I architecture
- Technical processes such as target detection, electronic warfare, and communications message flow

CONSTRUCTION: The C3ISIM model contains a number of processes that enable a user to create and store information on a wide variety of Blue and Red platforms. The types of platforms that can be represented range from major C2 nodes to individual weapon platforms. The actions that each platform can perform are controlled by a C2 ruleset. A ruleset is a group of software subroutines which manage the resources of a platform, carry out the platform's assigned role, and maintain its relationship with other platforms. Each platform is assigned its own ruleset. The model's ability to simulate technical processes (such as radar detection and radio transmission), C2 processes (C2 decision making and direction), and combat engagement processes (air-to-air, ground-to-air, etc.) in a single, dynamic user controlled environment places it at the forefront of present-day simulation tools.

LIMITATIONS: Fidelity, lack of available databases

PLANNED IMPROVEMENTS AND MODIFICATIONS: Ongoing upgrading

INPUT: - Aircraft flight paths and profiles
- Scenario data (flight path timing and ground deployments for both Red & Blue)
- Communication networks

OUTPUT: High-resolution video simulation of the scenario participants and

their actions. Each runtime process creates user specified data files during execution of a simulation in the form of ASCII and binary data files that can be manipulated and displayed or analyzed off-line at a later time.

HARDWARE AND SOFTWARE:

COMPUTER (OS): Silicon Graphics 4D-series workstation with UNIX v3.x operating system with Berkeley 4.3 enhancements.

STORAGE: Minimum disk storage depends upon user, but 760 Mb are recommened.

PERIPHERALS: A Personal computer is recommended for further processing of output files; Printer with serial interface to print statisitcs reports

PROGRAMMING LANGUAGE: C-programming language

DOCUMENTATION: Tactical Missile Defense Extended Air Defense Simulation (TMD/EAD SIM) model Executive Summary, TMD/EAD SIM Methodology Manual, TMD/EAD SIM User's Manual, TMD/EAD SIM Programmer's Manual.

OTHER COMMENTS: Commercial software applications are recommended to further manipulate output data; 32Mb RAM is rocommended for large scenarios

SECURITY CLASSIFICATION: Model is unclassified however classification will be dependent upon the classification of database input to the model.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Most performance & parametric data is available in standard US Government databases or reference documents; C3ISIM databases are TBD

CPU TIME PER CYCLE: A central European scenario with 400 platforms is about 1:1; with 1100 platforms changes to about 1:10

FREQUENCY OF USE: Daily

USERS: USAADASCH, USASDC, USAMICOM, USAASC, USACACDA, USATRAC, MISIC, US AIR FORCE, TELEDYNE BROWN ENGINEERING, CAS, DYNETICS

COMMENTS: Runtime varies greatly depending on hardware configuration, scope of scenario, and platform activity; it increases exponentially as the number of platforms increases.

TITLE: Canadian Land Forces Training/Operational/Research War Game

DATE IMPLEMENTED: 1980's.

MODEL TYPE: Training, Operational and Research using manual gaming with computer rules off-line.

PROPONENT: Directorate of Land Operational Research (DLOR), Operational Research and Analysis Establishment (ORAE), National Defence Headquarters, 101 Col By Drive, Ottawa, Ontario, Canada, K1A 0K2.

POINT OF CONTACT: Head, War Games Section, DLOR. (address above)

PURPOSE: The set of rules comprising the war game may be used in any of the above mentioned three roles. All games are manual with extensive computer support to assess outcomes of actions. The purpose is to model, with detail specific to the particular requirement, military situations which arise. As a research tool it deals with system effectiveness. As a training tool it is used both in team training and as an exercise driver for command post exercises. Each game may be played without computers by using manual loo-up tables.

DESCRIPTION: May be structured to meet sponsor requirements.

Domain: Land, Helo & F\W Air in support of ground forces.

Span: Regional.

Environment: Various, played on manual board.

Composition: Component elements, Blue and Red.

Scope: Conventional - special rule modules developed as required.

Mission Area: High and Medium intensity battlefield.

Level of Detail: Various, rule dependant, can play to individual weapon systems.

CONSTRUCTION:

Human Participation: Required for decisions and processes.

Time Processing: Dynamic, 5 minute game time steps.

Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, with one or more controllers.

LIMITATIONS: Requires experienced military gamers and computer operators all working from table top map of ground. The game can handle up to division level operations but is more suited to brigade and battalion operations.

PLANNED IMPROVEMENTS & MODIFICATIONS: As required for specific projects.

INPUTS: Weapons effects, orders of battle, scenario (from sponsor), organizations, tactics and orders.

OUTPUT: Various: Usually lists of current strengths, results of combat interactions, location, suppression, status, ammunition holdings, etc.

HARDWARE & SOFTWARE:
Computer: Now converted to PC DOS machines.
Storage: 20 MB Hard disk.
Peripherals: Printer.
Programming Language: Various, FORTRAN, Basic depending on modules used.
Documentation: DLOR Staff Note 89\16, "Program Description of the DLOR Computer Assisted War Game", by G. Buffington.

SECURITY CLASSIFICATION: UNCLASSIFIED without data.

GENERAL DATA:
Data Base: Various, weeks to months to complete.

CPU Time per Cycle: N/A.

Data Output Analysis: Almost instantaneous as instructions are input.

Frequency of Use: 3 to 5 times per year until 1988, now not used.

Users: Training: Staff Schools & Colleges, Brigades - Research: DLOR.

Comments: A flexible set of game rules which can be tailored to meet sponsor requirements.

TITLE: Cannon Row DATE IMPLEMENTED: 1986.

MODEL TYPE: Training and Education.

PROPONENT: Australian Army War Game Centre.

POINT OF CONTACT: Project Leader AWGC 62-2-9604411.

PURPOSE:
Analytical: No

1. Research & Evaluation
   a. Weapons Systems
      Systems Development?
      Systems Effectiveness?
   b. Force Capability and Requirements
      Courses of Action Assessment?
      Mix?
      Effectiveness?
      Resource Planning
   c. Combat Development
      Current or New Doctrine?
      Competing Strategies?
      Policy Study?

2. Operational Support Tool (Decision Aid)
   a. Skills Development
      Team? yes
      Individual? no
   b. Exercise Driver
      Field Training Exercise Driver? No
      Command Post Exercise Driver? Yes
      Individual Exercise Driver? No

DESCRIPTION:
Domain: Land.

Span: Local.

Environment: Day or night. All weather conditions.

Force Composition: Combined forces, limited joint forces. Blue and Red.

Scope of Conflict: Primarily conventional warfare using conventional weapons.

Mission Area: Covers all conventional missions.

LEVEL OF DETAIL OF PROCESS AND ENTITIES:
Entity: Individual weapon to brigade.
Process: Attrition of weapons and personnel based on individual kills. The probability of a kill is based on weapon characteristics, size of formations/units and postures.

CONSTRUCTION:

Human Participation:

(1) Required:
  (a) For Decisions? Yes
  (b) For Process? Required for movements
  (c) For Both?

(2) Not Required:
  (a) Interruptable?
  (b) Scheduled Changes?
  (c) Not permitted?

Time Processing:

(1) Dynamic:
  (a) Time Step? Yes. All events occur within a game discrete game turn.
  (b) Event Step? No
  (c) Closed Form? No

(2) Static:

Treatment of Randomness:

(1) Stochastic:
  (a) Direct Computation? Yes
  (b) Monte Carlo? No

(2) Deterministic:
  (a) Generate a value as a function of an expected value?
  (b) Basically Deterministic (No randomness)?

Sidedness:

(1) One-sided?

(2) Two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One side non-reactive?
    Both sides reactive? Yes

(3) Greater than two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One or more side non-reactive?
    All sides reactive?

LIMITATIONS: Land warfare only. Climatic conditions based on Australian Environment (requires modifications for other locations). Requires modifications for additional weapon types.

PLANNED IMPROVEMENTS/MODIFICATIONS: Attack rules are being enhanced. A personnel/equipment data base is being added to provide a breakdown of casualties by type and injury description.

INPUT: Unit posture and size, Weapon type, ammunition type, range.

OUTPUT: Results are displayed but may be optionally printed. Results may be stored for future analysis.

HARDWARE AND SOFTWARE:
Computer (OS): IBM PC AT/XT or compatible using MS DOS 3.2.
Storage: Limited game on 360k disk. Full game on 1.2MB disk. When data base implemented 20mb disk.
Peripherals: Optional Printer.
Programming Language: Borland Turbo Pascal Version 5.
Documentation: Manuals available.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Data Base: Not applicable.

CPU Time Per Cycle: Not applicable.

Data Output Analysis: No computerised analysis.

Frequency of Uses: More than 20 times per year.

Users: All units and training establishments.

Comments: Requires minimal set up. Board is required.

TITLE: Close Combat CCDECSIM

DATE IMPLEMENTED: Under development since 1990

MODEL TYPE: Analysis.

PROPONENT: OS1 Department, DRA, Fort Halstead.

POINT OF CONTACT: Mrs. J. Saunders, 0959 532222 ext 2924.

PURPOSE: Research and Evaluation of infantry weapon systems effectiveness.

DESCRIPTION:
Domain: Land.

Span: Local; individual.

Environment: Digitized terrain at 10m resolution. Terrain features include spot heights, 7 types of vegetation, 7 types of building, rivers, roads. Terrain culture facilitates rural through to small town areas. The model can simulate day or night scenarios.

Force Composition: Up to battery level.

Scope of Conflict: Conventional.

Mission Area: Any conventional mission within the domain.

Level of Detail: The lowest entities modelled are individual men and vehicles. Each entity is then divided further into substructures each with their individual functions modelled.

CONSTRUCTION:
Human Participation: Permitted, but interrupts gaming.

Time Processing: Dynamic time step.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, symmetric.

LIMITATIONS: Maximum of 100 units. Maximum terrain area of 6km x 5km.

PLANNED IMPROVEMENTS: Target selection and suppression; terrain modelling; MMI.

INPUT: Terrain data; Orbat (vehicle and personnel) and deployment; routes and orders; weapon and ammunition systems data.

OUTPUT: A variety of indicators are available for display during game run. Log of all lines of sight, acquisitions, direct and

indirect fire events.

HARDWARE AND SOFTWARE:

Computer/OS: VAX Station 3100 workstations, VMS 5.3 and VWS 4.1.

Storage: 650 MB.

Peripherals: None required.

Language: Pascal.

Documentation: Functional specification available. User guide yet to be issued.

SECURITY CLASSIFICATION: UK CONFIDENTIAL.

GENERAL DATA:

Time Required:

Data Preparation: Few hours upwards, depending on size and complexity.

Simulation: Typically two hours, but highly scenario dependant.

Data Output Analysis: At least four hours.

Frequency of Use: Rare.

Users: OS1 Department DRA.

Comments: Currently under development.

TITLE: CHEMical CASualty (CHEMCAS)

DATE IMPLEMENTED: 01/01/88

MODEL TYPE: ANALYSIS

PROPONENT: US Army Chemical School, Fort McClellan, AL 36205-5020

POINT OF CONTACT: CPT Kierzewski, ATZN-CM-CC, DSN: 865-4111/3307/3174
U.S. Army Chemical School, Fort McClellan, AL 36205-5020

PURPOSE: CHEMCAS is an analysis model used to evaluate chemical weapon systems effectiveness against personnel targets. Primary uses in the past included producing weapons effects tables for FM 3-10-2 and assessing the expected battlefield hazard from enemy chemical attacks.

DESCRIPTION: CHEMCAS is a stochastic, one-sided, chemical casualty and hazard area assessment model. Using individual munition footprints from transport and difussion models, CHEMCAS overlays these footprints on a target area and predicts casualties and contamination on the target. For each type munition, CHEMCAS considers errors in target location, Mean Point of Impact (MPI), and round-to-round ballistic disperion. CHEMCAS does not consider terrain explicitly but the terrain does affect the footprints that CHEMCAS uses.

CONSTRUCTION: Once the input streams are specified and execution started human intervention is not allowed. The model is dynamic in that it portrays the effects of agent for user specified time intervals and considers the effects from rounds that arrive on the target at differing times. Using bivariate random errors, CHEMCAS generates random impact points then overlays the munition footprints on the target and accumulates the dosages and depositions. CHEMCAS is one-sided and can consider multiple targets and fire units but this capability has not been exercised recently.

LIMITATIONS: Fireplanning done off-line. One route of entry for the chemical agent.

PLANNED IMPROVEMENTS AND MODIFICATIONS: PC version with integrated graphics is planned. Also integration of graphics into the mainframe version.

INPUT: Weapon parameters such as, agent fill and dissemination characteristics, ballistic errors, and aiming procedures. Environmental conditions to include windspeed, temperature, and stability. Target area size, orientation,

OUTPUT: Computer printouts with raw data, statistics, and analyzed data.

HARDWARE AND SOFTWARE:

COMPUTER (OS): UNYSIS 1100/70 OS 1100

STORAGE: 1 Meg memory (to run either main program or NUSSE3 cloud generator), 3.8 Meg disk.

PERIPHERALS: Line printers

PROGRAMMING LANGUAGE: ASCII FORTRAN

DOCUMENTATION: Written by SAIC Feb 88; never published.

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 1 hr for normal runs (one type of munition)

CPU TIME PER CYCLE: 5 min

DATA OUTPUT ANALYSIS: Upper and lower confidence levels, expected values.

FREQUENCY OF USE: Quarterly.

USERS: USACMLS

COMMENTS: Currently linked to NUSSE3 transport and diffusion model. Will use NUSSE4 when that model becomes available.

TITLE: Combat Analysis Sustainability Model (CASMO)

MODEL CATEGORY: Analysis (Logistics)

PROPONENT: U.S. Army Concepts Analysis Agency
Attn: Force Systems Directorate
8120 Woodmont Avenue
Bethesda MD 20814-2797

POINT OF CONTACT: Rene Carlucci, DSN: 295-5292, (301) 295-5292

PURPOSE: CASMO is used to analyze division level operations of maintenance and logistics support in peace or war time. It is designed to serve as both an operations support and a capability assessment of major weapon systems to meet mission requirements.

DESCRIPTION: CASMO is a stochastic, event-step simulation model representing the operation of maintenance and logistic support within Army Divisions. CASMO is designed to assess the capability of U.S. Army combat units and their supporting maintenance and logistics organizations to: (1) maintain and repair weapon systems, (2) reorder spare parts, and (3) perform other maintenance and logistics support functions under a variety of operational environments.

Domain: Land

Span: Accommodates any division in a theater depending on data base.

Environment: Cartesian Coordinate based, all terrain. Models shifts in day and night, peace and war time, combat postures.

Force Composition: Any type of division, Blue and Red

Scope of Conflict: Conventional warfare, conventional weapons excluding fixed wing aircraft for maintenance repair

Mission Area: All conventional missions

Level of Detail of Processes and Entities: Models company level, resolution to bumper number of weapon systems, man-hours of MOS, service equipment and spare parts by NSN, fuel in gallons, ammunition in rounds.

CONSTRUCTION:
Human Participation: Human participation is not required during simulation. Decisions are made at input.

Time Processing: Dynamic, Time and event step model. Progress through events during a given combat cycle time period.

Treatment of Randomness: Scheduled and unscheduled maintenance requirements are randomly selected at each failure. All vehicles

have assigned bumper numbers and vehicles are assigned for maintenance by random selection of bumper numbers. Selection of damaged part for combat maintenance is a random process. CASMO uses delay distribution for several types of time delays. Time delays range from deterministic delays to stochastic delays and include most of the traditional probability distributions. These are Deterministic, Exponential, Uniform, Normal, Log-normal, Gammer, Weibull and Emperical distributions.

Sidedness: Two-sided but operations of logistics supports for only the blue side.

LIMITATIONS: Fixed wing aircraft weapon system is not modeled. Attrition of maintenance system and repair personnel are not modeled. Supply trucks are not modeled, though delay distributions are used.

PLANNED IMPROVEMENT/MODIFICATIONS: Rotary wing weapon system (Helicopters) will be modeled.

INPUT: CASMO requires three categories of input data to complete sustainability analysis. These are: (1) scenario data that include weapons and ammunition to be modeled, combat unit and maintenance unit organization, and resources of maintenance unit, (2) unit action data that define battery or company maneuvers and combat action during the simulated engagements, and (3) combat damage data that determine how many combat "hits" each blue weapon system receives. Combat damage data is combined with shotline data derived from the Sustainability Prediction for Army Spare Components Requirements for Combat (SPARC) to generate a list of parts damaged for repair.

OUTPUT: CASMO produces two types of outputs including a summary report and a detailed historical event file. The summary report contains two categories of information, namely, queuing statistics and maintenance resources utilization statistics. The summary report is designed to present summary information useful to three types of users: (1) a maintenance decision maker, (2) a supply decision maker and (3) an operational decision maker. The summary report contains MOS utilization per shift, maintenance throughput, utilization of equipment/recovery vehicle/contact vehicle, deferred maintenance actions, parts status, number of back orders, fuel/ammunition supply data, number of type weapon systems down, and availability of weapon systems

HARDWARE AND SOFTWARE:
Computer(OS): VAX 11/780, VAX 8600 (VMS)
Storage: 6 M-bytes
Programming Language: SIMSCRIPT, FORTRAN
Documentation: Analyst Guide, User Training Manual
Adequately documented

SECURITY CLASSIFICATION: Programs are UNCLASSIFIED, input data are classified.

GENERAL DATA:

Data Base: Data base must be developed for type of weapon systems modeled. Once the data base has been developed, a large portion of data may not need to change for each study unless there is a need to model a new weapon system.

Time Requirements: 24 weeks (for preparation, run and analysis).

Frequency of Use: Plans 2 studies per year.

Users: OTEA, CAA

TITLE: Combat Identification System COMO Integrated Air Defense (CISCIAD) Model (CISCIAD)

DATE IMPLEMENTED: 06/01/87

MODEL TYPE: Analysis

PROPONENT: TRADOC Analysis Command - White Sands (TRAC-WSMR), White Sands Missile Range, NM 88002-5502

POINT OF CONTACT: Mr. Bill Garrett, USATRAC-WSMR, ATRC-WBC, White Sands Missile Range, NM 88002-5502; DSN 258-2307/3668

PURPOSE: CISCIAD is used primarily for system level effectiveness studies of tactical AD systems. It is also appropriate for mission planning and employment/deployment analysis, force structure evaluations, firing doctrine & battle management algorithm development, & evolutionary concept evaluation. CISCIAD is a research & evaluation tool. Weapons system: sys development and evaluation. Force capability & reqmnts: courses of action assessment, mix, effectiveness, & resource planning. Cbt Dev: current or new doctrine, competing strategies & policy study.

DESCRIPTION: CISCIAD simulates large scale battles between air defenders and an air threat in a conventional environment. It is usable up to Theater level and typically portrays joint forces. The model represents the functional activities of the defenders and the threat as they interact with each other and the environment. A digitized terrain data base is used to depict the terrain relief as well as cultural features of the battlefield. The effects of environmental factors and counter measures are simulated.
The level of detail which is modeled for entities and processes is typically at the individual system level and sometimes at the sub-system level. The entities simulated include air defense missile and gun systems, interceptor aircraft, defense suppression and penetrator aircraft copters, early warning and tracking radars, combat identification systems, command and control element, communication links, tactical ballistic missiles, cruise missiles, jammer and escort aircraft, air bases, airspace weapons control volumes, and defended assets.
DOMAIN: air and/or land.
SPAN: theater, regional, local or individual.
ENVIRONMENT: terrain relief, weather, time or day terrain cultural features.
FORCE COMPOSITION: combined forces, joint forces, component or element.
SCOPE OF CONFLICT: conventional.
MISSION AREA: air defense.

CONSTRUCTION:
HUMAN PARTICIPATION: not required and not permitted.
TIME PROCESSING: dynamic - event step.
TREATMENT OF RANDOMNESS: stochastic - Monte Carlo.
SIDEDNESS: two-sided - symmetric.

LIMITATIONS: The maximum number of fire units and aircraft that can be played are 300 and 1024 respectively. Nuclear & chemical warfare & total logistics are not currently modeled. There is no ground-to-ground combat.

PLANNED IMPROVEMENTS AND MODIFICATIONS: When time permits, a graphical package will be developed to assist and speed scenario generation and

analysis results. Package will relate to 'analyst workstation' currently

INPUT: Threat and friendly aircraft characteristics and vulnerabilities; SHORAD system characteristics; HIMAD system characterisitcs; Aircraft flight paths and profiles; Command and Control element characteristics; ECM jamming data; Combat identification system data; Visibility data for HIMAD and SHORAD positions.

OUTPUT: Computer printout of RED and BLUE kills, time of kills, detection ranges, engagement ranges, kill ranges, killer-victim scoreboards, aircraft identification proficiency, of movement, etc. Graphics playback of movement, engagements, and kills.

HARDWARE AND SOFTWARE:

COMPUTER (OS): UNISYS 1192, VAX (VMS), CRAY, IBM, HP 9000 (UNIX)

STORAGE: 25K - 150K words (scenario dependent)

PERIPHERALS: Disc storage and printer. Color Graphics: RAMTEK

PROGRAMMING LANGUAGE: FORTRAN 77 (FORTRAN 8x for UNISYS)

DOCUMENTATION: VEDA Report Number 103292-86U/P1035 Program Specification, 17 Feb 87; VEDA Report Number 103066-87U/P1035 User's Manual, 6 May 87, General Research Corp CR-2-985 A COMO Integrated Air

OTHER COMMENTS: DOCUMENTATION CONTINUED: Defense Model with Command and Control, Apr 81.

SECURITY CLASSIFICATION: Unclassified code.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Scenario dependent but usually between 2 months and 6 months.

CPU TIME PER CYCLE: Scenario dependent. Battle time/cpu time = 1 for medium sized scenario on HP 9000/600 (15 MIP machine).

DATA OUTPUT ANALYSIS: Post processor cpu time = 5 min on HP 9000/600

FREQUENCY OF USE: Continuous.

USERS: TRAC-WSMR, CAA, USAADASCH, MICOM

COMMENTS: Integrated FAADS Simulation (IFS) at MICOM and COMO are related models. Government contractors with a valid contract requiring the use of CISCIAD can also obtain the model with the approval of the TRAC Commander. Inquiries should be addressed to TRAC-TOD, Ft. Leavenworth, KS 66027-5200 or call AV 552-5511 or commercial 913-684-5511.

TITLE: Combat Prescribed Load List Model - Combat PLL Model

DATE IMPLEMENTED: 1984.

MODEL TYPE: Analysis.

PROPONENT: U.S. Army Materiel Systems Analysis Activity (AMSAA), Inventory Research Office (IRO), 800 U.S. Custom House, 2nd and Chestnut Streets, Philadelphia, PA 19106-2976.

POINT OF CONTACT: Marty Cohen/Meyer Kotkin, DSN 444-3808/09 or (215) 597-8377.

PURPOSE: The Combat PLL model is used by the Army Materiel Command (AMC) to compute Mandatory Parts Lists (MPLs). The MPLs are minimum stockage quantities needed to support an organization in a specified combat environment. The model is an analytic model which uses the theory associated with S-1, S continuous review inventory systems with Poison demands. It computes the minimum cost stockage needed to achieve a target for the average number of equipment operating in the 15 most intense days of combat. Stockage for each end item is computed separately. Common parts need to be rolled up by the user.

DESCRIPTION:

Domain: Land and air.

Span: Computes stockage for organizational level of repair.

Environment: Controlled by wartime usage rates which are developed outside model.

Force Composition: Blue forces.

Scope of Conflict: Controlled by wartime usage rates.

Mission Area: Provide stockage requirements for the first 15 days of combat.

Level of Detail of Processes and Entities: Calculates PLL level demands.

CONSTRUCTION:

Human Participation: Not required nor permitted while model is running.

Time Processing: Dynamic, time and event stepped model.

Treatment of Randomness: Basically deterministic.

Sidedness: One-sided.

LIMITATIONS: Cannibalization is a not played in the model. The Poison demand process is not dependent on the number of operating end items. Direct support supply is assumed available in an Order Ship Time (OST) with a known probability.

PLANNED IMPROVEMENTS AND MODIFICATIONS: To be determined based on need.

INPUT: Candidate Item File (CIF) which identifies the parts used on a given end item along with, for each part, mean usage between removal of the part, the removal task distribution, line replacement unit code, and unit price. End item identification and densities. Mission profile with 15-day expected usage for the end item for various measures of usage.

OUTPUT: Stockage list for each end item at each density. Expected average NMCS during 15 days of intense combat.

HARDWARE AND SOFTWARE:
Computer: Runs on a GOULD computer with a UNIX operating system but can be easily modified for other computers.
Storage: Not significant.
Peripherals: Minimum requirement is 1 VT100 terminal.
Programming Language: FORTRAN.
Documentation: Documented.

SECURITY CLASSIFICATION: UNCLASSIFIED, but data may be classified.

GENERAL DATA:
Data Base: Varying, depending on data.

CPU Time per Cycle: Varying, depending on applicability of existing data.

Data Output Analysis: Varying, depending on desired end product.

Frequency of Use: Used several times per year by those listed below.

Users: AMSAA, AMC Major Subordinate Commands (MSCs), and MRSA.

Comments: Combat Authorized Stockage List (ASL) Model handles similar data at direct support level of maintenance.

Releasability: Releasable.

TITLE: Combat Sample Generator (COSAGE V) DATE IMPLEMENTED: 1980

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Mr. John Warren, (DSN) 295-1690 or (301) 295-1690

PURPOSE: COSAGE is a computerized combat assessment/weapons effectiveness model which develops information on ammunition expenditures and losses of personnel and equipment during a 24 to 48-hour period of combat. The principal application is the forecasting of personnel, ammunition, and equipment requirements.

DESCRIPTION:

Domain: Land and air

Span: Division area of operations

Environment: When terrain parameters are required, the model randomly selects a terrain type based on statistical analysis of the region of interest. These parameters are then used to determine line of sight, movement rates, etc. Night and day are modeled, and visibility varies by time of day.

Force Composition: Combined arms army, including helicopters and close air support.

Scope of Conflict: Conventional warfare

Mission Area: Most of the mission areas associated with conventional combined arms are represented, with the exceptions of logistics and intelligence.

Level of Detail of Processes and Entities: Maneuver unit resolution is typically down to Blue platoons and Red companies. In the case of close combat, resolution is to the level of individual equipment or personnel and their weapons, with each direct fire shot modeled explicitly.

CONSTRUCTION:

Human Participation: None

Time Processing: Dynamic event step

Treatment of Randomness: Stochastic, Monte Carlo

Sidedness: Two-sided, symmetric

LIMITATIONS: Electronic, biological, chemical, and nuclear warfare are not modeled, nor military operations in built-up areas.

Logistics and intelligence functions are not represented.

PLANNED IMPROVEMENTS/MODIFICATIONS: No major improvements are planned.

INPUT: Unit organizations, strength, and weapons; orders for each maneuver unit; weapons data (single shot probability of kill, lethal area); sensor capabilities; terrain parameters; movement rates; artillery organization and characteristics.

OUTPUT: Killer-victim scoreboard, personnel losses, ammunition expenditures by shooter/target combination, materiel losses, and unit locations on plot by time.

HARDWARE AND SOFTWARE:
Computer (OS): UNISYS 1100 series, with Exec 8. Has also been installed on various machines with UNIX operating systems.
Storage: 420K words of memory for model and data.
Peripherals: Line printer.
Programming Language: SIMSCRIPT II.5
Documentation:
- Combat Sample Generator User's Manual, DTIC B070095L
- Combat Sample Generator Program Maintenance Manual, DTIC B073013L

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA:
Time Requirements
Data Base: 6 man-months required to acquire data, plus 3 man-months required to structure data in model input form.

CPU Time Per Cycle: 90 minutes on UNISYS 1100

Data Output Analysis: 1 month

Frequency of Use: Support for ten to fifteen studies a year

User: U.S. Army Concepts Analysis Agency

Comments: COSAGE is linked to the following models: FORCEM (Force Evaluation Model), CEM (Concepts Evaluation Model), WARF (Wartime Replacement Factors), and WARS (Wartime Ammunition Rates System).

TITLE: COMBAT-SIM DATE IMPLEMENTED: 1986

MODEL TYPE: Training and Education.

PROPONENT: Australian Army War Game Centre.

POINT OF CONTACT: Project Leader AWGC 62-2-9604411.

PURPOSE:
Analytical:
1. Research & Evaluation
   a. Weapons Systems
      Systems Development?
      Systems Effectiveness?

   b. Force Capability and Requirements
      Courses of Action Assessment?
      Mix?
      Effectiveness?
      Resource Planning

   c. Combat Development
      Current or New Doctrine?
      Competing Strategies?
      Policy Study?

2. Operation Support Tool (Decision Aid)
   a. Skills Development
      Team? Yes
      Individual? No

   b. Exercise Driver
      Field Training Exercise Driver? No
      Command Post Exercise Driver? Yes
      Individual Exercise Driver? No

DESCRIPTION:
Domain: Land.

Span: Regional/local.

Environment: Day or night. Full range of weather. Terrain (height, slope, vegetation).

Force Composition: Joint and Combined Forces. Red and Blue.

Scope of Conflict: Conventional.

Mission Area: All conventional missions.

Level of Detail of Process and Entities:
Entity: Section/squad up to company.

Process: Intervisibility, movement detection, attrition, generation of casualties (battle and non-battle), ammunition and fuel usage.

CONSTRUCTION:

Human Participation:

(1) Required:
- (a) For Decisions? Yes. (System continues to run)
- (b) For Process? No
- (c) For Both?

(2) Not Required:
- (a) Interruptable?
- (b) Scheduled Changes?
- (c) Not permitted?

Time Processing:

(1) Dynamic:
- (a) Time Step? Real time
- (b) Event Step? No
- (c) Closed Form? No

(2) Static:

Treatment of Randomness:

(1) Stochastic:
- (a) Direct Computation? Yes
- (b) Monte Carlo? No

(2) Deterministic:
- (a) Generate a value as a function of an expected value?
- (b) Basically Deterministic (No randomness)?

Sidedness:

(1) One-sided?

(2) Two-sided:
- (a) Symmetric?
- (b) Asymmetric
  - One side non-restrictive?
  - Both sides reactive? Yes

(3) Greater than two-sided:
- (a) Symmetric?
- (b) Asymmetric
  - One or more side non-reactive?
  - All sides reactive?

LIMITATIONS: Maximum of 384 units. Maximum of a 2 Battalion Brigade scenario.

PLANNED IMPROVEMENTS/MODIFICATIONS: Increase the number of stations to allow for more than 2 Battalion Brigades. Increase the number of units to be modelled.

INPUT: Scenario, unit characteristics, weapon characteristics, terrain characteristics.

OUTPUT: Report printouts, Video map with graphics overlay.

HARDWARE AND SOFTWARE:
Computer (OS): IBM PC AT MS DOS 3.2. Ten stations networked
Storage: 20MB disk per station (more preferred)
Peripherals: Laser video disk, graphics overlay device, printers, joy stick.
Programming Language: MODULA 2.
Documentation: Draft.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Data Base: 3 man days.

CPU Time per Cycle: Not applicable.

Data Output Analysis: No.

Frequency of Uses: 12 times per year.

Users: Battalions/Brigades, Advanced Officer Courses.

TITLE: Combined Arms and Task Force Evaluation Model (CASTFOREM)

DATE IMPLEMENTED: 01/01/90

MODEL TYPE: Analysis

PROPONENT: Tradoc Analysis Center - White Sands Missle Range (TRAC-WSMR), WSMR, NM 88002

POINT OF CONTACT: Carrol R. Denney, TRAC-WSMR, Bldg 1401, WSMR, N.M. 88002 Telephone: DSN: 258-3029 Commercial 505-678-3029

PURPOSE: Lowest echelon, highest resolution, systemic cbt sim mdl in AMIP family of cmpter sim, force-on force mdls. It is mostly a research & analysis tool used to select among competing weapon sys in a COEA process. Useful to examine/develop tactics; parametric analysis on weapon sys perf. As a weapons sys tool it is useful in analyzing weapons sys effectiveness; as force capability & reqmnts tool, it is useful in action assessment, mix effectiveness & resource planning; as cbt dev tool it is useful to assess the effects of competing strategies (tactics).

DESCRIPTION: CASTFOREM is a stochastic, event-sequenced, opposing forces simulation of ground combat involving up to an attacking brigade force and against a defending reinforced regiment. Although not artificially constrained by programming considerations, practical limitations of computer run time and complexity of analysis would dictate that the above force sizes be considered maximum and that battle times be constrained to firefights of ninety minutes or less. All types of weapons both conventional and unconventional are modeled. Weapon categories include Direct Fire (ballistic, guided and smart), Lasers (HELAWS and LELAWS); Land Mines; Indirect Fire (mortars, missiles, ICM, HE, etc.), High Powered Microwave, and bombs.

CONSTRUCTION:
Human Participation: Not required -- Fully automated simulation.
Time Processing: Dynamic, Event stepped.
Treatment of Randomness: Stochastic.
Sideness: Two sided symetric.

LIMITATIONS: RAM is not explicitly represened except for missiles. Weather is static throughout the duration of the game; EW is generally implicit except for jamming red radars.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Improvements and modifications are driven by study requirments.

INPUT: Terrain Description parameters; Environment parameters; Weapons effects data; Weapon system descriptions; Unit orders; Decision tables; Organizational structures; CS and CSS equipment data; Communications data and network structures; Tactical Areas descriptors; Sensor data; Maneuver network structure; Unit description data; Output directives.

OUTPUT: Each event specified by the output descriptors is recorded for postprocessing; An extensive and comprehensive set of post processing routines is availabe with the model. Graphical playback is also available.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX Series running VMS; SUN RISC machines running UNIX;

HP 900 series running UNIX; CRAY/UNIX; Silicone Graphics.

STORAGE: Computer main memory ahould be at least 32 megabytes on the VAX machines and 64 megabytes on the UNIX based machines.

PERIPHERALS: Disk storage should be at least 300 megabytes; cartridge or reel tape;

PROGRAMMING LANGUAGE: Simscript II.5 and Fortran.

DOCUMENTATION: Available in six volumes and annually updated. The six volumes are: Executive Summary; User's Input Guide; Post-Processor's Users Guide; Methodologies Manual; Scenario Writer's Guide; V&V Manual.

OTHER COMMENTS: Configuration Control is tightly controlled by TRAC Model Control Policy. User Group meets periodically.

SECURITY CLASSIFICATION: The Model, itself, is Unclassified, However some input data may be classified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Setup and data acquisition times vary according to scenario, previous model usage and experience. 2 weeks to 4 months.

CPU TIME PER CYCLE: Variable. Smallest scenarios run at 5 minutes/rep while largest run up to 4 hours per rep; Average cpu/battle = 1.75/1.00

DATA OUTPUT ANALYSIS: Variable. Large studies normally require 2 to 3 months.

FREQUENCY OF USE: Daily at TRAC-WSMR, Variable at other installations.

USERS: TRAC, ARMOR SCHOOL, Engineer School, FISTC, ARDEC, SMO, MICOM, DARPA, and limited Army Contractors.

COMMENTS: Government agencies can obtain CASTFOREM with a signed memorandum of agreement. Government Contractors with a valid contract requiring the use of CASTFOREM can also obtain the model with the approval of the TRAC Commanding General. Inquiries for obtaining the model and supporting data bases should be addressed to TRAC-TOD, Ft. Leavenworth, Ks. 66027-5200 or calling at DSN: 552-5511 or commercial 913-684-5511.

TITLE: COMO-T (COMO-T)

DATE IMPLEMENTED: 10/26/90

MODEL TYPE: Analysis

PROPONENT: Directorate of Combat Developments, Concepts & Studies Division, US Army Air Defense Artillery School, Ft. Bliss, TX

POINT OF CONTACT: MANUEL AMARO, USAADASCH, ATSA-CDC-M, FT BLISS, TX 79916-0002, DSN: 978-2304/1238

PURPOSE: To simulate air defense war games from one-one-one engagements to theater force level.

DESCRIPTION: COMO III is a computerized, two-sided, analytical damage asssment/weapon effectiveness model. COMO-T is the machine transportable version of COMO III and runs on DEC VAX and UNIVAC computers. COMO III is a framework for the construction of system-level simulations of tactical an strategic weapon systems in a modular and mutually compatible form. The COMO frame, when assembled with FORTRAN weapon decks which describe the interacting systems, form a critical event-stepped Monte Carlo simulati. It is flexible as to game size and input/output format and is extra effcient in memory use.

CONSTRUCTION: Simulation consists of a FRAME, a combination of WEAPON decks (Red and Blue), and a user supplied scenario (Timing, A/C Tracks, RVIS).

LIMITATIONS: May be long turnaround time dependent upon machine/scenario Model is manpower intensive in setup time and output data reduction; Run time increases nonlinearly with number of aircraft in scenario.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Dynamic line of sight (DLOS) is in the process of being implemented.

INPUT: - Threat aircraft characteristics and vulnerabilities
- ADA system chracteristics (weapons decks)
- Aircraft flight paths and profiles
- Scenario data (flight path timing and ground deployments)
- Threat munition characteristics
- ECM jamming levels

OUTPUT: - Computer printout with input data, kill summary, and specialized statistics on a per-site/per-aircraft basis
- Data tape for extensive post-processing at a later time

HARDWARE AND SOFTWARE:

COMPUTER (OS): MicroVAX 3500 with VMS Operating System

STORAGE: 2-RA70 280 Mb disk drives
2-ADS 1.2 Gb disk drives

PERIPHERALS: 1-TU81 1/2" MAG Tape Drive; 1-TK50-70 Tape Cartridge Drive; 1-Decwriter III System console; 1-C. ITOH 400 lpm printer; 7-user terminals

PROGRAMMING LANGUAGE: FORTRAN

DOCUMENTATION: Programmers Reference Guide and Users manual for each of the weapon decks and the COMO Input Language (COMIL)

OTHER COMMENTS: none

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 2-3 days for RVIS; 2-5 hrs for DLOS

CPU TIME PER CYCLE: 1-5 minutes for small scenarios

DATA OUTPUT ANALYSIS: Dependent on study

FREQUENCY OF USE: 3-4 major & 6-8 minor studies/year

USERS: USAADASCH

TITLE: Computer Assisted Map Exercise (CAMEX)

DATE IMPLEMENTED: 07/19/91

MODEL TYPE: Analysis

PROPONENT: TRADOC Analysis Center (TRAC), Operations Analysis Center (OAC), Fort Leavenworth, KS 66027-5200

POINT OF CONTACT: Mr Calkins, ATRC, FMV, DSN: 552-4595, TRAC-OAC, Fort Leavenworth, KS 66027-5200

PURPOSE: CAMEX is a comprehensive computer-assisted map exercise used to simulate the significant aspects of Army doctrine for scenario development and weapon system trade-off analysis.

DESCRIPTION: CAMEX is a map oriented game whose major components are a set of unit locations represented on military maps and a set of manual and computerized assessment algorithms. Both of these are governed by a set of game rules. Computer assessments of combat attrition are based on the methodololgy derived from the Vector in Commander (VIC) model. A menu-driven program architecture executed on a SUN or HP windows terminal allows wargamers to position forces; define movement routes and combat activities; coordinate artillery and attack helicopter support; resupply, reorganize, or reconstitute forces; view combat results; and generate reports in a timely manner.

CONSTRUCTION: CAMEX is a computer assisted map exercise with the major bookkeeping and assessment results handled by the computer. It can be interrupted at any interval the gamer desires. It is deterministic with direct fire assessments and movement updated every minute of game time with artillery missions being activitated by the gamer.

LIMITATIONS: - Intelligence is controlled by the gamer
- Fixed wing assessment is computed off line
- Documentation not complete

PLANNED IMPROVEMENTS AND MODIFICATIONS: None.

INPUT: - Force structure
- Weapons played
- System performance data
- Terrain

OUTPUT: - KV score board
- Ammo expended
- Graphic locations of units' position
- Current strengths of units

HARDWARE AND SOFTWARE:

COMPUTER (OS): Unix

STORAGE: 100MB

PERIPHERALS: None

PROGRAMMING LANGUAGE: SIMSCRIPT

DOCUMENTATION: - CAMEX input data guide
- Gamer manual
- Executive summary

OTHER COMMENTS: None

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 2 weeks to 2 months

CPU TIME PER CYCLE: 1 minute CPU / 1 hour battle

FREQUENCY OF USE: Quarterly at TRAC-OAC

COMMENTS: None

TITLE: Concepts Evaluation Model (CEM) DATE IMPLEMENTED: 1974

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: William T. Allison, (DSN) 295-5236

PURPOSE: CEM is used primarily to analyze force effectiveness in theater-level warfare. It is designed to provide a tool to assess the effectiveness of different mixes of forces and resources and to estimate ammunition, equipment, and personnel requirements.

DESCRIPTION:

Domain: Land and Air

Span: Accommodates any theater given a data base; has been used for Korea, Southwest Asia, and Central Europe

Environment: Terrain consists of three types representing good cross country maneuverability, marginal cross country maneuverability and road bound. Natural and man-made barriers are also represented. Terrain is described in rectangular bands. Each 12-hour division level cycle represents average proportion of day and night. No weather.

Force Composition: Combined forces for Blue and Red

Scope of Conflict: Conventional warfare

Mission Area: All conventional missions except unconventional warfare.

Level of Detail of Process and Entities: Simulates command decisions at four levels from theater to division. Force inputs as Blue brigade and Red division. Combat occurs between Red divisions and Blue brigades along a continuous FEBA. Accommodates up to 70 Blue and 125 Red divisions with up to 51 types of weapons. Aircraft are aggregated into two types; Air Defense Fighters and Tactical Fighters. The latter are given daily missions of Counter Air (CA), Armed Recon/Interdiction (AR/I), or Close Air Support (CAS). Attrition to CA and AR/I are probability of kill. Attrition to CAS and divisional personnel and equipment is derived from results of a high resolution simulation used to extrapolate for the actual weapons in the CEM engagements. Logistics are highly aggregated. Movement of FEBA is a function of attacker and defender final to initial combat worth ratios.

CONSTRUCTION:
Human Participation: None. Fully automated

Treatment of Randomness: A deterministic expected value combat simulation. However, a stochastic version (STOCEM) is available. It treats decisions, disposition of losses, recovery of damaged vehicles, and FEBA movement as stochastic processes.

Time Processing: Time step based on a 12-hour division level cycle

Sidedness: Two-sided, symmetric model

LIMITATIONS: Does not model breakthrough, airborne assaults, engineer functions, transportation, lines of communication, electronic, chemical, or nuclear warfare.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Different combat attrition samples for night and day; deep fires against second echelon and arriving forces; combat attrition of GS artillery.

INPUT: Terrain map; troop lists; TOEs (personnel, ammo, POL, other supplies, tanks, APCs, helicopters, anti-tank missiles, and artillery); shooter-target results from high resolution simulation; resupply and replacement rates (personnel, ammo, POL, other supplies, and weapons); arrival schedule for resupply, reinforcing artillery battalions, and maneuver units; and FEBA movement tables.

OUTPUT: Computer reports stating (periodic) FEBA locations, posture profiles, state of opposing forces, resources expended, KIA, WIA, CMIA, and DNBI; and weapons hit, destroyed, damaged, abandoned, and repaired. Graphic (plotter or color CRT) display of same results.

HARDWARE AND SOFTWARE:
Computer: UNISYS 1100/84; CRAY XM-P/48; CRAY II
Storage: 1.2 million decimal words
Peripherals: Two tape drives or disks; one printer
Programming Language: ASCII FORTRAN
Documentation: CAA-D-85-1, Volume I, Technical Description, January 1985 (Revised October 1987); CAA-D-85-1, Volume II, Users' Handbook, August 1985. (Revised January 1990)

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA:
Data Base: Acquisition - 2 months; Preparation - 18 man-months

CPU time per Cycle: UNISYS 1100/84 - 36 hours (for 180 days simulation); CRAY XM-P/48 -4 hours (for 180 days simulation)

Data Output Analysis: 2 months

Frequency of Use: 800 times per year

Users: U.S. Army Concepts Analysis Agency

Comments: CEM is dependent on results from a higher-resolution division model (presently COSAGE) for combat attrition and munition expenditures.

TITLE: CFAW - Contingency Force Analysis Wargame

DATE IMPLEMENTED: N/A

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
Attn: (CSCA-SPC)
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Mr. Russell Pritchard, (301) 295-4711, (DSN) 295-4711.

PURPOSE: CFAW is used primarily to examine both operation plans and contingency plans and to analyze potential conflict.

DESCRIPTION:
Domain: Land, Air, and over-the-shore naval operations.

Span: Scale depends on specific study needs. Reasonable span ranges from division to small theater.

Environment: Hex-based. Each hex edge incorporates 1 of 10 possible types of road and off-road trafficability factors. Each hex is one of seven terrain types, which include mountains, hills, null, flat, swamp, urban, and water. Hex size is an input parameter; the current model can employ four 49x49-hex maps. Weather, time of day, and day and night are modeled.

Force Composition: Combined and joint forces can be modeled.

Scope of Conflict: Conventional conflict with rear area and noncontiguous FLOT. Nuclear and chemical play is limited to initial effects (no effects of contamination, persistence, collateral damage, etc.).

Mission Area: Air (DCA, CAS, BAI), direct and indirect fire (including TBM and rockets), air defense, airlift (including airborne and airmobile), and barrier operations are represented.

Level of Detail of Processes and Entities: Land combat units can be modeled from company to division as discrete entities with brigade/regiment being the preferred entity size. Units are collections of direct and indirect fire weapon types, each having a descriptive data base of acquisition and kill probabilities, fire distribution, and other input parameters. Attrition on units in direct fire combat is adjudicated by a differential equation. Equation parameters are obtained from a detailed, Monte Carlo simulation model. Attrition varies with posture and terrain. Combat is initiated by attack by an aggressor unit and terminated upon player command or by breaching a player specified attrition threshold. Model is a single-echelon command and control; players must give orders to each unit played for movement. Air units are

modeled as squadrons of individual aircraft that can be given ground attack, defensive counter-air, or escort missions.

CONSTRUCTION:
Human Participation: Required for all unit mission and movement decisions

Time Processing: Dynamic, Time-step. Game time to real time is variable

Treatment of Randomness: Stochastic, Monte Carlo

Sidedness: Two-sided, symmetric

LIMITATIONS: Unreproducible results due to stochastic randomness and player variabilities. Altitude is not played, which degrades air defense fidelity. Player span of control limits practical number of entities per side to approximately 100. Player decision variability does not permit replication of a specific game. Small unit combat, to include SOF-type activities, is not modeled.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Enhanced logistics effects and improved ability to divert air missions to immediate targets.

INPUT: Units: weapon counts, ground speed, supply consumption rates, indirect fire damage capability and range, unit size, and designation. Scenario: terrain description. Attrition: individual weapons data, terrain effects on weapon densities, probabilities of detection and kill for each weapon target pairing, expected aircraft specific exchange ratios, and air defense effectiveness. Game: initial map position and arrival time for each unit played.

OUTPUT: Current status (strength, position, and activity) and map picture of playing screen as desired during game. Strengths over time of weapons by location, activity, type, etc. as desired by analyst in tables and charts.

HARDWARE AND SOFTWARE:
Computer: VAX 780/8600 cluster; VMS version 5.43
Storage: 300K blocks
Peripherals: Five DEC VT102 terminals, three Ramtek RGB monitors with driver, one printer
Language: FORTRAN
Documentation: Under development

SECURITY CLASSIFICATION: Unclassified, but data bases are often classified.

GENERAL DATA:
Data Base: One to three weeks (given information availability)

CPU time per Cycle: Approximately one-third of elapsed time.

Data Output Analysis: Postprocessor/analytical aids, hard copy, order streams

Frequency of Use: Three to four different war game scenarios per year

Users: USACAA operates war game for DA Staff, Army agencies and major commands

Comments: USACAA performs configuration control, model improvements, and maintenance

TITLE: Corps Ammunition Model Expanded (CAM-X)

DATE IMPLEMENTED: 01/01/82

MODEL TYPE: Analysis

PROPONENT: USA TRADOC Analysis Command, Ft Lee (TRAC-LEE)

POINT OF CONTACT: Bruce E. Lasswell, DSN: 539-1816, Ft Lee, VA 23801

PURPOSE: CAM-X is designed to furnish information on how ammunition requests may be satisfied under constraints of supply point lift, transportation network and enemy attack.

DESCRIPTION: This model, a MAWLOGS derivative, may be either stochastic or deterministic. Requirements for ammunition are input into the model based on other model outputs or SCORES scenarios. Ammunition is loaded onto generic convoys and moves over a given network to the user. Route and mode selection are dynamic based on a shortest path algorithm. Supply points (lift assets and stock), convoys, and the transportation network may be attacked. All phases of transportation (load, unload, consolidation, transhipment) are considered.

CONSTRUCTION:
HUMAN PARTICIPATION: Not required.
TIME PROCESSING: Dynamic, event-step.
TREATMENT OF RANDOMNESS: Either stochastic, Monte Carlo or basically deterministic as required by the user.
SIDEDNESS: One-sided.

LIMITATIONS: Model requires extensive data input and is not directly related to combat models.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None.

INPUT: Transportation network, ammunition demands (from other model outputs or SCORES scenario), destruction probabilities, rebuild times, and unit locations and movement.

OUTPUT: Ammunition delivered, ammunition destroyed, transportation mode utilization and schedules.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/780 (VMS), SUN 4/280 (UNIX)

STORAGE: Variable.

PERIPHERALS: Printer and tape drive.

PROGRAMMING LANGUAGE: FORTRAN 77M, GASP IV.

DOCUMENTATION: A Users Guide for LOGATAK, A Simulation Model to Analyze Logistic Network Distributions and Interdiction. 1977, (DLSIE LD 42543-MB).

OTHER COMMENTS: CAM-X was created using the Models of the Army Worldwide Logistics System (MAWLOGS).

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: N/A.

CPU TIME PER CYCLE: Varies.

DATA OUTPUT ANALYSIS: Varies.

FREQUENCY OF USE: As needed.

USERS: U.S. Army Ordnance Missile and Munitions School, CASCOM.

COMMENTS: Government agencies can obtain CAM-X with a signed memorandum of agreement. Government Contractors with a valid contract requiring the use of CAM-X can also obtain the model with the approval of the TRAC Commanding General. Inquiries for obtaining the model and the supporting data bases should be addressed to TRAC-TOD, Ft. Leavenworth, KS 66027-5200 or call DSN: 552-5511 or commercial 913-684-5511.

TITLE: CORPS BATTLE ANALYZER (CORBAN)

DATE IMPLEMENTED: 05/01/90

MODEL TYPE: ANALYSIS

PROPONENT: TRADOC ANALYSIS COMMAND(TRAC), OPERATIONS ANALYSIS CENTER (OAC) FORT LEAVENWORTH, KANSAS 66027-5200

POINT OF CONTACT: MRS. HORNER, ATRC-FM, DSN: 552-4595/2533
TRAC-OAC, FORT LEAVENWORTH, KS 66027-5200

PURPOSE: A RESEARCH AND DEVELOPMENT TOOL USED FOR COURSES OF ACTION ASSESSMENT, MIX AND EFFECTIVENESS EVALUATIONS IN FORCE CAPABILITY AND REQUIREMENT ANALYSES. IN COMBAT DEVELOPMENT STUDIES, THE SIMULATION CAN BE USEFUL IN EXAMINING NEW OR CURRENT DOCTRINE AND CAPABILITY STRATEGIES. ALSO CAN BE USED AS AN EXERCISE DRIVER FOR CPX OR SEMINAR TRAINING.

DESCRIPTION: CORBAN SIMULATES BATTLE AT THE OPERATIONAL LEVEL BETWEEN A BLUE CORPS AND A RED ARMY. WHILE THE PRIMARY FOCUS IS ON THE GROUND BATTLE, THE MODEL ALSO PLAYS CLOSE AIR SUPPORT, BATTLEFIELD AIR INTERDICTION, HELICOPTER OPERATIONS, ARTILLERY, AND AIR DEFENSE. THE MODEL IS AN AGGREGATED REPRESENTATION OF EACH FUNCTIONAL AREA. TERRAIN RESOLUTION IS TO 3.5 KM HEXES WITH REPRESENTATION OF ROADS, RIVERS, RUGGEDNESS, AND URBANIZATION. THE EFFECTS OF DAY AND NIGHT ARE PORTRAYED. CORBAN HAS THE CAPABILITY TO PORTRAY COMBINED AND JOINT FORCES WITH ENTITY RESOLUTION AT BATTALION (IN SPECIAL CASES, SQUADS AND PLATOONS CAN BE REPRESENTED). MODEL PROCESSES ARE PERCEPTION, ATTRITION, COMMAND & CONTROL, AND MOVEMENT.

CONSTRUCTION: THE MODEL IS CLOSED, ONCE LOADED, IT REQUIRES NO HUMAN PARTICIPATION TO RUN. IT IS A DYNAMIC ARCHITECTURE WHICH IS TIME STEPPED. CORBAN IS AN EXPECTED VALUE, DETERMINISTIC SIMULAITON THAT IS SYMMETRICALLY TWO-SIDED.

LIMITATIONS: AGGREGATED OUTPUT DATA; NO EXPLICIT PERSONNEL PLAYED.

PLANNED IMPROVEMENTS AND MODIFICATIONS: NONE

INPUT: FORCE STRUCTURE
SYSTEMS DATA
TERRAIN
OPERATIONAL ORDERS: GENERIC OPERATIONS TEMPLATES
DETAILED OPERATIONS ORDERS
SEARCH PATTERNS

OUTPUT: COMMAND AND CONTROL TRACE
FEBA PLOT
VARIETY OF ASSESSMENT DATA: KILLER-VICTIM SCOREBOARD
ENGAGEMENT TRACE
ASSET ATTRITION SUMMARY
UNIT STATUS
AIR SENSOR TARGET LISTS

HARDWARE AND SOFTWARE:

COMPUTER (OS): DEC VAX/VMS MICROVAX, 780, 785, 8600
(SUN WORKSTATION TO USE BATTLESHOW POST-PROCESSOR)

STORAGE: 50K

PERIPHERALS: PLOTTER OR SUN FOR BATTLESHOW PLAYBACK CAPABILITY

PROGRAMMING LANGUAGE: FORTRAN FOR MODEL AND BATTLESHOW. PASCAL POST PROCESSOR ROUTINES FOR PLOTTER & OTHER OUTPUT ANALYSIS PROGRAMS.

DOCUMENTATION: DEEP ATK PROG OFF FINAL RPT, 30 JUN 85; TECH OVERVIEW, MAR 87; CORBAN VOL I-USERS MANUAL,JUL 90; CORBAN VOL II-DATA STRUC,JUL 90; CORBAN VOL III-SOFTWARE ARCH, JUL 90; CORBAN VOL IV-OPS GUIDE, APR 86.

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 2-3 WEEKS IF STARTING WITH AN EXISTING DATABASE. 1-6 MONTHS IF NEW DATA REQUEST NEEDS TO BE SUBMITTED.

CPU TIME PER CYCLE: DEPENDENT UPON COMPUTER-E.G. 1 HR CPU/2 HRS BATTLE ON MICROVAX, 1 HR CPU/6 HRS BATTLE ON 785.

DATA OUTPUT ANALYSIS: 2 HRS WITH BATTLESHOW POST PROCESSOR. 12 HRS WITHOUT BATTLESHOW POST PROCESSOR.

FREQUENCY OF USE: MONTHLY AT TRAC

USERS: DEEP FIRES, O/O STUDY, ENGINEER STRUCTURE STUDY, HEAVY FORCES MODERNIZATION, ACORDS PARAMETRIC RANGING, DEEP ATK PROGRAMS OFFICE.

COMMENTS: GOVERNMENT AGENCIES CAN OBTAIN CORBAN WITH A SIGNED MEMORANDUM OF AGREEMENT. GOVERNMENT CONTRACTORS WITH A VALID CONTRACT REQUIRING THE USE OF CORBAN CAN ALSO OBTAIN THE MODEL WITH THE APPROVAL OF THE TRAC COMMANDING GENERAL. INQUIRIES FOR OBTAINING THE MODEL AND SUPPORTING DATA BASES SHOULD BE ADDREDDED TO TRAC-TOD, FT. LEAVENWORTH, KS 66027-5200 OR CALL AT DSN: 552-5511 OR COMMERCIAL 913-684-5511.

TITLE: Corps Battle Simulation (CBS) System
(formerly called JESS) (CBS)

DATE IMPLEMENTED: 11/01/89

MODEL TYPE: Training and Education

PROPONENT: U.S Army Combined Arms Command - Training
ATTN: ATZL-CTS, Ft. Leavenworth KS 66027

POINT OF CONTACT: CPT Howard Lee, CAC-T National Simualtion Center
DSN: 552-3180, COMM (913) 684-3180, Ft Leavenworth, KS 66027

PURPOSE: CBS is an automated command post exercise (CPX) driver designed to serve coprs and division level staffs as well as seperate briga command groups.

DESCRIPTION:
DOMAIN: Land and air.
SPAN: Local.
ENVIRONMENT: Terrain modeled as 3 km hexes.
FORCE COMPOSITION: Joint forces.
SCOPE OF CONFLICT: Conventional, chemical and nuclear.
MISSION AREA: CBS models all mission areas associated with a corps.
LEVEL OF DETAIL OF PROCESSES AND ENTITIES: Units are modeled down to battalion.

CONSTRUCTION:
HUMAN PARTICIPATION: Human participation required for decisions. Simulation will run without decisions.
TIME PROCESSING: Dynamic, time-step.
TREATEMENT OF RANDOMNESS: Stochastic, Monte Carlo.
SIDEDNESS: Two-sided, asymmetric. Both sides reactive.

LIMITATIONS: Long set-up time and extensive controller staff required.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None

INPUT: Interactive order input from controller staff.

OUTPUT:
Graphic and printed output in message format.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 6420, 13 MicroVaxII. VMS.

STORAGE: 900 K for exercise purposes

PERIPHERALS: Digipads, terminals, printers, TV monitors.

PROGRAMMING LANGUAGE: SIMSCRIPT, C

DOCUMENTATION: User manuals, analysts guide.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 3 months

USERS: All U.S. corps and division staffs.

TITLE: Corps Level Artillery Systems Simulation (CLASS)

DATE IMPLEMENTED: 1991

MODEL TYPE: Analysis.

PROPONENT: OS2 Department, DRA Fort Halstead, Sevenoaks, Kent

POINT OF CONTACT: Dr G. Cran, 0959 532222 ext 2801.

PURPOSE: A research and evaluation tool to examine the operational effectiveness of artillery systems in the All Arms battle.

DESCRIPTION:

Domain: Land.

Span: Corps.

Environment: Terrain and cultural features represented to 500m resolution, with vertical features resolved to the nearest meter. Acquisition is modified to represent day/night.

Force Composition: Primarily artillery forces and their surveillance and target acquisition but other arms (mainly ground systems) represented.

Scope of Conflict: Conventional.

Mission Area: Corps and division-level artillery systems.

Level of Detail of Processes and Entities: The lowest entity modelled is generally a troop on Blue and a company on Red, but some high value equipments are represented as individual vehicles e.g., MLRS launcher. Attrition is represented in most detail for indirect fire. Acquisition by the different surveillance and target acquisition assets is represented and subsequent engagement is determined by rules covering priorities, desired effect and ammunition selection. Movement is along predefined routes. Direct fire attrition is based on a Lanchester process.

CONSTRUCTION:

Human Participation: Non-interactive.

Time Processing: Dynamic, event step.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, asymmetric with both sides reactive.

LIMITATIONS: None beyond those implicit in a model of the type described here.

PLANNED IMPROVEMENTS/MODIFICATIONS: Continually updated to incorporate new systems.

INPUT: ORBAT, opening deployment, planned movement, terrain data base and equipment characteristics.

OUTPUT: Computer printouts and a data base giving statistics on artillery systems' use.

HARDWARE AND SOFTWARE:
Computer: Dec VAX machines (6400 or more powerful) VAX/VMS.
Storage: cpu: 20 Mbyte; disk; 1.8 Gbyte (for program, input data and 5 replications of output).
Peripherals: Printers, Sigmex graphics terminal.
Development: Developed using the Jackson System Development (JSD) method and supporting tools.
Programming Language: VAX PASCAL.
Documentation: Functional specification and JSD produced documents.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Time Requirements:
Data Base: 2-3 man-months initially.

CPU Time per Cycle: Typically 3-4 hours on a VAX 6400 for 8-10 hours of a Blue division versus 4 Red divisions.

Data Output Analysis: Large volume of output can be produced but usually specific items are identified for output then fed into a DB for subsequent analysis.

Frequency of Use: Continuous.

Users: UK MOD, DRA Fort Halstead.

Comments:

TITLE: Countermine Combat Model - COUNTERCOM

DATE IMPLEMENTED: 1980

PROPONENT: U.S. Army Belvoir Research, Development, and Engineering Center, Ft Belvoir, VA 22060-5606

POINT OF CONTACT: Keith Dugas, Advanced Systems Concepts Office DSN 654-2138 or Comm (703) 704-2138

PURPOSE: COUNTERCOM was developed to realistically model, at a very high level of resolution (i.e., individual weapon systems), tank/anti-tank combat; air-to-surface and surface-to-air engagements; the effects of indirect artillery and mortar fire (including obscuration and suppression); tactical maneuver and fire plans; the direct and indirect effect of land mines and other obstacles; and countermine/counter-obstacle systems. Besides the applications of mobility/counter-mobility systems within the framework of the modern, integrated battle-field.

DESCRIPTION:

Domain: Land and Air.

Span: Accommodates any region depending on data base; one data base scenario completed but outdated.

Environment: Grid-squares. Models transportation barriers. Uses intervisibilities of defender/attacker path pairs.

Force Composition: Combined forces, Blue and Red.

Scope of Conflict: Conventional.

Mission Area: Close air support, indirect artillery.

Level of Detail of Processes and Entities: High resolution; can model individual units, systems. Intelligence and communications modeled. Attrition are based on probabilities, Monte Carlo for individual units.

CONSTRUCTION:

Human Participation: Not required. Human participation not permitted once execution begins.

Time Processing: Dynamic, time-step.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, asymmetric, both sides reactive.

LIMITATIONS: Stationary defenders, fixed attack paths, has not been updated since 1980.

PLANNED IMPROVEMENTS/MODIFICATIONS: None

INPUT: Scenario (area of interest, obstacles, terrain intervisibility), defensive types, defensive positions, air defense types, offensive types, sensor reconnaissance routes, tactics tables, probabilities, indirect fire systems, unit paths.

OUTPUT: Ground truth map, input data, battlefield perception map, lane availability map (for minefields), maneuver tactics selected, results file (list of events simulated), graph of survivors vs time, offensive and defensive casualty summaries, m-kills, k-kills, percent survivors by type.

HARDWARE AND SOFTWARE:
Computer: CDC CYBER 6000 series, NOS/VE OS.
Storage: Minimum 75K
Peripheral: Graphics printer, batch or interactive terminal
Programming Language: FORTRAN 4 Extended, with some routines in COMPASS 3.
Documentation: Available from DTIC, 2 Vols, ADB061097L

SECURITY CLASSIFICATION: UNCLASSIFIED, data bases can be classified.

GENERAL DATA:
Data Base: 6 man-months for new data base

Data Input: 1 man-week to structure input into model

CPU Time per Cycle: About 10 seconds per cycle.

Data Output Analysis: 1 - 2 days.

Frequency of Use: Infrequent

Users: BRDEC

Comments: Has not been updated to include new scenario, weapons data, probabilities in recent times.

Releasability: Only to U.S. Government agencies.

TITLE: Directed Microwave Energy Weapon Simulation (DMEWS)

DATE IMPLEMENTED: September 1987

MODEL TYPE: Analysis

PROPONENT: U.S. Army Materiel Systems Analysis Activity (AMSAA)

POINT OF CONTACT: Director, USAMSAA, ATTN: AMXSY-CS (Mr. Craig Kobren), Aberdeen Proving Ground, MD 21005-5071, DSN 298-6231 or Comm 301 278-6231.

PURPOSE: A research and evaluation tool used at the component level during system development to estimate the effect of a high power microwave pulse on various electric systems or subsystems. The source and its output characteristics are considered as well as atmospheric propagation, coupling to and location of various entry points on a target, emission losses between the entry point and component, component coupling, and the target path. The primary measure of effectiveness provided by the model is probability of component failure as a function of range and engagement time. DMEWS is a digital, one-on-one engagement model between ground or air targets and a Directed Microwave Energy Weapon (DMEW). The engagement dynamics include probability theory and a version of the AMSAA INCURSION model which has been modified by replacing the air defense gun routine with microwave weapon routines.

DESCRIPTION:

Domain: Land and air.

Span: Individual component.

Environment: Existence of line-of-sight is assumed.

Force Composition: Individual component.

Scoper of Conflict: Any.

Mission Area: Counter to weapons or platforms that contain electrical circuits.

Level of Detail of Processes and Entities:

Entity: System component or subsystem.

Processes: Degrades or kills electrical circuits.

CONSTRUCTION:

Human Participation: Not permitted.

Time Processing: Static, single-pulse model.

Treatment of Randomness: Stochastic, direct computation.

Sidedness: One-sided.

LIMITATIONS: Single pulse probability only; Limited database at higher frequencies.

INPUT: Microwave Generator Characteristics; Antenna Characteristics; Atmospheric/Meteorological conditions; Entry Point Characteristics and Location; Target Component Characteristics; Engagement Parameters.

OUTPUT: Time; Range; Power Density; Accessibility; Access Angles; Probability of damage of each susceptible Component.

HARDWARE AND SOFTWARE:
Computer (OS): IBM PC (DOS)
Storage required: 640 K
Peripherals: None
Programming Language: FORTRAN 77
Documentation: Available. DDC Accession Number: None.

SECURITY CLASSIFICATION: (Model without data) UNCLASSIFIED.

GENERAL DATA:
Data Base: N/A (time required to prepare).

CPU Time per Cycle: 2 seconds.

Data Output Analysis: Analyst dependent.

TITLE: Direct Fire Stand-Alone Model - DFSAM

DATE IMPLEMENTED: 1985.

MODEL TYPE: Analysis.

PROPONENT: OS1 Department, DRA, Fort Halstead.

POINT OF CONTACT: N. Roberts, 0959 532222, ext 2289.

PURPOSE: Research and Evaluation of weapon systems effectiveness.

DESCRIPTION:
Domain: Land.

Span: Local (typically up to 20km front).

Environment: Digitized terrain, representing relief, vegetation and man-made cover, 500m resolution.

Force Composition: Heterogeneous direct fire units, and "off-table" artillery.

Scope of Conflict: Conventional.

Mission Area: Direct fire battle.

Level of Detail: Company (Red) vs Troop (Blue). High-value units (e.g. LRGW) may be represented individually. Lanchester-based attrition. Movement is along preplanned routes, at speed governed by local going.

CONSTRUCTION:
Human Participation: Not required, but is permitted.

Time Processing: Partially time-sliced, partially event sequenced.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, symmetric.

LIMITATIONS: No infantry. No C3I.

PLANNED IMPROVEMENTS: None.

INPUT: Weapon characteristics (range, time of flight); Minefield and barrier data (location, mine density, etc.); Orbat, deployment, routes, orders; Systems data (DF, minefield lethality, artillery lethality).

OUTPUT: Killer/victim tables, by replication and averaged; Mine and artillery kills.

HARDWARE AND SOFTWARE:
Computer/OS: VAX/VMS.
Storage: 20 MB (40000 blocks).
Peripherals: Requires DEC VT100, VT200 or VT300 compatible terminal.
Language: FORTRAN 77.
Documentation: User's guide, Programmers's guide.

CLASSIFICATION: UNCLASSIFIED.

GENERAL DATA:
Time Required:
Data Preparation: Several weeks.
Preprocessor: Few CPU minutes.
Simulation: Approx one minute CPU time per minute of battle.
Analysis Package: Minimal.
NB timings are based on a complex main defensive action scenario.

Frequency of Use: Rare.

Users: OS1 Department DRA.

Comments: DFSAM uses the same DF modelling as the Divisional War Game (DWG) from OS2, DRA, and was originally intended to be used to replicate small elements of the DWG campaign and DFSAM normally uses systems data files created for DWG use. It is intended that the modelling link between the two models be maintained.

TITLE: Divisional War Game - DWG DATE IMPLEMENTED: 1975.

MODEL TYPE: Analysis.

PROPONENT: OS2 Department, DRA Fort Halstead, Sevenoaks, Kent.

POINT OF CONTACT: Mr P. Denny, 0959 532222 ext 2404.

PURPOSE: A research and evaluation tool primarily concerned with examining the use of proposed weapon systems but also contributing to the analysis of concepts of operations.

DESCRIPTION:

Domain: Land, with representation of air operations in less detail.

Span: Corps.

Environment: Terrain and cultural features represented to 500m resolution. Meteorological effects vary with time of day.

Force Composition: All arms, but with less attention paid to direct fire systems than to others.

Scope of Conflict: Conventional.

Mission Area: Corps and division level systems.

Level of detail of processes and entities: The lowest entity modelled is generally a troop, but some high value equipments are represented as individual vehicles. Attrition is represented in most detail for indirect fire and AH; movement and engagement are at players' discretion constrained by the rules of the game. Communications between players simulate the net structure of the force.

CONSTRUCTION:

Human Participation: Is required for decisions, without which the game would run but not make sense. Multiple command levels are explicitly represented.

Time and Processing: Dynamic, event step.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, symmetric.

LIMITATIONS: Numbers of individual units less than 4000 each side. Rate of play typically 10-15 minutes real time to 1 minute combat time.

PLANNED IMPROVEMENTS/MODIFICATIONS: Continually updated to incorporate new systems. Much of the software is being reimplemented.

INPUT: ORBAT, opening deployment, equipment characteristics.

OUTPUT: Controllers' report; data appropriate to study topics. An archive of past series is maintained from which data are provided for a wide range of studies.

HARDWARE AND SOFTWARE:
Computer: Dec 8810, VAX/VMS (dedicated).
Storage: CPU: 128 Mbyte, disk: 3 Gbyte.
Peripherals: 6 Sigmex graphics terminals; 2 micro VAX II; 30-40 VDUs; 20-25 printers; 2 line printers; 2 magnetic tape drives; 10 Macintosh IIci graphics workstations.
Programming Language: VAX FORTRAN (being reimplemented in C).
Documentation: Functional specification.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Time Required:
Data Base: 20-30 days, including deployment of units using Macintosh graphics workstation.
CPU time per cycle: Dependent on phase of battle (i.e., number of units in play and their activities). In practice, cpu time is less critical than the players in determining game speed.
Data Output Analysis: An extensive relational data base is created for each game and used to derive statistical and other information on weapon system performance. The data base is implemented in RdB (full supporting documentation is available).

Frequency of Use: A series of 5 games (each lasting 1 month) is played each year, plus occasional extra activities.

Users: UK MOD, DRA Fort Halstead.

Comments: A replay facility is available for limited replication and parametric variation.

TITLE: Division Level War Game Model - DIVLEV

DATE IMPLEMENTED: 1969

MODEL TYPE: Analysis

PROPONENT: U.S. Army Materiel Systems Analysis Activity (AMSAA)

POINT OF CONTACT: Director, USAMSAA, ATTN: AMXSY-CC (Mr. Tony Rouse), Aberdeen Proving Ground, MD 21005-5071, DSN 298-5771 or Comm 301 278-5771 .

PURPOSE: A research and evaluation tool used during system development and to estimate system effectiveness.

DESCRIPTION: DIVLEV is both a stand-alone combat simulation and man-in-the-loop war game. The methodology has been calibrated through comparisons with historical battle results. The model was developed to produce realistic tactical situations, accounting for the environment and capabilities of opposing forces, and including unit orders, optional contingency orders, movements and attrition as a function of time. These situations are used in the evaluation of various item level materiel systems and in evaluations of weapon mixes. The resolution of units that the players control is usually determined by the objective of the study and the tactics the players intend to use. Generally, the player-controlled units are of battalion or company size. DIVLEV is structured so that players control the organization for combat. They can use either standard TO&E units or task forces, and these units can be at either full or reduced strength. The players give orders and optional orders to each unit which include the route the unit is to take, the unopposed speed at which it is to move, the dimensions of the unit (whether deployed or in column), and the direction the unit is to face upon reaching its destination. Optional orders are activated when player described conditions are met. Once an optional order is activated, the old order is discarded and the unit starts on its new assignment. DIVLEV contains a representation of suppression by both direct and indirect-fire weapons, a treatment of system reliability, and a representation of close air support. Suppression effects are based on combat experience. Target acquisition is played explicitly. The time step is variable.

Once sets of player-generated contingency orders have been developed, the model can be used as a combat simulation. In this mode, the same player inputs are used, but different weapon characteristics, artillery target priorities, sensor mix, artillery attack criteria, and so forth can be input. This feature allows for the parametric evaluation of weapon and support systems, doctrine, and trade-offs among them in terms of force success.

Domain: Land and air.

Span: Regional.

Environment: Terrain relief, mobility characteristics and cultural features, weather, and time of day.

Force Composition: Combined forces.

Scope of Conflict: Conventional.

Mission Area: Tactical combined arms.

Level of Detail of Processes and Entities:
Entity: Blue Division, Red Army.
Processes: Movement, target acquisition, command and control, attrition, suppression.

CONSTRUCTION:
Human Participation: Optional, for decisions, and if there is human participation the model is designed to be interrupted for the introduction of a new set of decisions.

Time Processing: Dynamic, time step.

Treatment of Randomness: Deterministic.

Sidedness: Two-sided.

LIMITATIONS: Unit logistics are recorded, not individual weapon

PLANNED IMPROVEMENTS/MODIFICATIONS: Effort is underway to improve real-time visual displays and pre- and post-game processing.

INPUT: Tactical scenario--initial situation and unit objectives; Weapon data--range, rate of fire, crew size, weight of ammunition, and range dependent kill rates; Terrain statistics, wooded and urban areas; Unit data to include position, equipment strength and maneuver instructions; Vehicle speeds.

OUTPUT: Plots showing unit position; Unit data to include unit position, strength, and interaction with opposing units; Killer-victim scoreboard; The time interval for any of the output can be specified by input codes.

HARDWARE AND SOFTWARE:
Computer (OS): SUN (UNIX), VAX 11/785 (UNIX).
Storage required: 150K
Peripherals: Disc storage, tape, printer, video, work stations.
Programming Language: FORTRAN 77
Documentation: "DIVLEV War Game Computer Program," USAMSAA, January 1977.

SECURITY CLASSIFICATION: (Model without data) UNCLASSIFIED.

GENERAL DATA:

Data Base: Four man-months for initial development, Division vs. Army; three man-months for weapon and other system, and terrain data.

CPU Time per Cycle: SUN, simulation mode, two hours per 24 hours of simulated combat; SUN, war game (man-in-the-loop) mode, 15 minutes per one hour game step.

Data Output Analysis: One week per variation from initial game, plus one month after last variation for summaries.

TITLE: ELAN PLUS (ELAN+)

DATE IMPLEMENTED: Data not available

MODEL TYPE: Analysis

PROPONENT: TRADOC-Analysis Command - White Sands (TRAC-WSMR), White Sands, NM 88002-5502

POINT OF CONTACT: Dr. H. M. Sassenfeld, TRAC-WSMR, ATRC-W, WSMR, NM 88002- 5502, DSN: 258-1615, Commercial (505) 678-1615.

PURPOSE: ELAN+ is used as a research & development tool that deals with weapons effectiveness & terrain analysis. It is a force capability & frquirements tool that deals with course of action planning and tactics analysis. It is a combat developments tool used for operational & organizational concept development.

DESCRIPTION: ELAN+ is a medium resolution, two-sided, event sequenced, deterministic/stochastic combat model for brigade and battalion level. Combat activities modeled are maneuver, acquisition, direct fire, fire support, smart munitions, mines, smoke, and weather. Actions and reactions can be triggered (specifiably) for maneuver, fire, terrain, and other environment. Interactively driven by menus and graphics. Extensive analysis capability of digital terrain.

CONSTRUCTION:
HUMAN PARTICIPATION: Fully automated/Man-in-the-loop.
TIME PROCESSING: Dynamic, event sequenced.
TREATMENT OF RANDOMNESS: Stochastic-Monte Carlo or Basically Deterministic
SIDEDNESS: Two-sided.

LIMITATIONS: Brigade level; no logistics; no explicit communications

PLANNED IMPROVEMENTS AND MODIFICATIONS: Dismounted infantry, Air Defense.

INPUT: Routes of forces, forced (specifiable by unit and task force), maneuver and fire support schedules, weapon performance data (from AMSAA data derived values) from video terminal; Weapon prformance data from tape; Digital terrain.

OUTPUT: In graphics and print: scenario, terrain map, measures of effectiveness hierarchical force diagram.

HARDWARE AND SOFTWARE:

COMPUTER (OS): Hewlett Packard 9000 series; UNIX, HPBasic; SUN IV, UNIX, PASCAL

STORAGE: Memory - 8 MB RAM

PERIPHERALS: Hard disk, printer, color monitor

PROGRAMMING LANGUAGE: HPBasic, PASCAL

DOCUMENTATION: Available

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Immediate changes.

DATA OUTPUT ANALYSIS: Menu options of data analysis.

USERS: TRAC-WSMR.

COMMENTS: Government agencies can obtain ELAN+ with a signed memorandum of agreement. Government contractors with a valid contract requiring the use of ELAN+ can obtain the model with the approval of the TRAC commander. Inquiries should be addressed to TRAC-TOD, Ft. Leavenworth, KS 66027-5200 or call DSN: 552-5511 or commercial 913-684-5511.

TITLE: Electronic Warfare Multiple Sensor Analysis (EMSA)

DATE IMPLEMENTED: 1983

MODEL TYPE: Analysis.

PROPONENT: OS2 Department, DRA Fort Halstead, Sevenoaks, Kent TN147BP, UK.

POINT OF CONTACT: Mr P.C. McMahon, 0959 532222, ext 2353.

PURPOSE: EMSA is a research and evaluation tool for the study of data fusion in communications intelligence (COMINT), using AI techniques. It is being assessed currently as a possible training aid.

DESCRIPTION:

Domain: Abstract.

Span: Typically Army/Corps.

Environment: None.

Force Composition: ORBAT independent.

Scope of Conflict: Conventional.

Mission Area: All missions which generate electromagnetic radiation susceptible to Electronic Support Measures (ESM).

Level of Detail of Processes and Entities: CLASSIFIED

CONSTRUCTION:

Human Participation: Not required, participation not permitted.

Time Processing: Static.

Treatment of Randomness: Basically deterministic, uses rule-based and constraint-based reasoning.

Sidedness: One-Sided.

LIMITATIONS: Cannot be used in an ELINT role.

PLANNED IMPROVEMENTS/MODIFICATIONS: Development of all-source fusion version known as IMSA, using constraint based reasoning, IMSA, using constraint based reasoning. IMSA being ported to Sun workstations.

INPUT: EOB, ESM results from Electronic Warfare Simulation (EWS).

OUTPUT: Raw or processed data, magnetic media or printout.

HARDWARE AND SOFTWARE:

Computer: MicroVax II, VAX 11/785, VMS version 5.4.
Storage: Minimum disc requirement 100 Mbytes (current environment 7.6 Gbytes). Minimum CPU requirement 20 Mbytes RAM (current configuration 128 Mbytes).
Peripherals: Any DEC compatible terminals or printers, minimum requirement 1 VT100s, 1 printer Graphical display on Macintosh II computers.
Programming Language: VAX Pascal, Quintus Prolog.
Documentation: Functional and technical specifications to NATO standard AQAP 13, and British Standard (BS)5750 Part 1. CLASSIFIED.

SECURITY CLASSIFICATION: CLASSIFIED.

GENERAL DATA:
Time Requirements:
Data Base: Typically less than 5 man-days to prepare complete EOB.

CPU Time per Cycle: Typically two hours of scenario time processed in 5 minutes real time.

Data Output Analysis: Comprehensive environment for the analysis of results, including scoring of unit identification. Graphical display using MIDAS.

Frequency of Use: Continuous software development. Typically a maximum of two studies carried out in parallel.

Users: UK MoD, DRA Fort Halstead. Earlier version supplied to TRAC(USA).

Comments: Additional models interface with EMSA. EDP summarizes the performance of the COMINT analysis. MIDAS is a highly interactive display and analysis tool for the examination of output from EMSA.

TITLE: Electronic Warfare Simulation (EWS)

DATE IMPLEMENTED: 1978

MODEL TYPE: Analysis.

PROPONENT: OS2 Department, DRA Fort Halstead, Sevenoaks, Kent TN147BP, UK.

POINT OF CONTACT: Mr P.C. McMahon, 0959 532222 ext 2353

PURPOSE: The EWS is a research and evaluation tool for the study of communications and electronic warfare at the tactical and operational levels of command. It is used to assess the effectiveness of communications and EW equipment and tactics. The current version of EWS is the 1991 revision.

DESCRIPTION:

Domain: Land, with limited air-to-ground EW capability.

Span: Army/Corps

Environment: Terrain representation in azimuth to 500m, elevation to 1m. Culture classified as clear, urban or wooded. Electromagnetic environment modelled to 1kHz frequency interval, 1dB power level. Time of day used for HF propagation.

Force Composition: ORBAT independent. Any unit possessing electromagnetic equipment can be represented.

Scope of Conflict: Conventional, with potential to represent EMP effects.

Mission Area: All missions requiring the use of communication systems.

Level of Detail of Processes and Entities: Individual emitters (e.g., radio sets) represented as entities. Processes, e.g., ECM, operate on individual emissions.

CONSTRUCTION:

Human Participation: Not required, scheduled changes. Can be used interactively.

Time Processing: Dynamic, time and event step.

Treatment of Randomness: Deterministic, generates a value as a function of an expected value.

Sidedness: Two-sided symmetric.

LIMITATIONS: Data base restriction of maximum 4000 units. Time step (6 seconds) too long for some types of emitter to be represented faithfully.

PLANNED IMPROVEMENTS/MODIFICATIONS: Extensive programme of redesign and restructure underway, intended to replace the EWS by 1994. New model to be called CEWS (Communications and Electronic Warfare), employing object oriented design and C++ implementation. CEWS will be fully event driven.

INPUT: EOB, deployment of emitters, EMCON policy and duty cycles, technical characteristics.

OUTPUT: Raw or processed data (using performance metrics), magnetic media or printout.

HARDWARE AND SOFTWARE:
Computer: VAX 6000-440, VMS version 5.4.
Storage: Minimum disc requirement 150 Mbytes (current environment 7.6 Gbytes). Minimum CPU requirement 20 Mbytes RAM (current configuration 192 Mbytes).
Peripherals: Any DEC compatible terminals or printers, minimum requirement 2 VT100s, 1 printer. Graphical display on Macintosh II computers.
Programming Language: VAX FORTRAN, Rapport relational data base.

Documentation: Functional and technical specifications to NATO standard AQAP 13, and British Standard (BS) 5750 Part 1. CLASSIFIED.

SECURITY CLASSIFICATION: CLASSIFIED.

GENERAL DATA:
Time Requirements:
Data Base: Scenario dependent, typically 3 -6 man months for corps-level study.

CPU Time per Cycle: Typically one minute of scenario time equals 15 minutes real time.

Data Output Analysis: Comprehensive environment for the analysis of results. Susceptibility analysis, measures of performance tailored for the study requirements.

Frequency of Use: Continuous software development. Typically a maximum of two studies carried out in parallel.

Users: UK MoD, DRA Fort Halstead. Earlier versions supplied to ORAE Canada, USAICS, TRAC(USA).

Comments: Additional models interface with EWS MIDAS is a highly interactive display and analysis tool for the validation of input and the examination of output from the EWS. IGRP summarizes results from ESM collection. EMSA carries out COMINT analysis of ESM results, using IKBS techniques.

TITLE: Evaluation of Air Defense Effectiveness - EVADE II

DATE IMPLEMENTED: June 1969.

MODEL TYPE: Analysis.

PROPONENT: U.S. Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD 21005-5071.

POINT OF CONTACT: Wyoming Paris/Everett White, DSN 298-6382/84.

PURPOSE: The EVADE model is used to evaluate the survivability and effectiveness of aircraft and aircraft systems, and the effectiveness of air defense weapons, countermeasures, tactics and techniques. It is a deterministic model that evaluates fixed and rotary-wing aircraft in-scenario, in combat with an array of ground air defense gun and missile systems utilizing digitized terrain. Aircraft fly predetermined paths over prepositioned weapons systems. EVADE II is a research and evaluation tool that permits study of air vehicle interactions with air defense gun and missile systems.

DESCRIPTION:

Domain: Ground-to-air and air-to-ground.

Span: Regional, limited, or local arena.

Environment: Digitized terrain (cities, forest, orchards, high grass, bare earth), RF and IR signatures, weather and lighting, ECM.

Force Composition: Multiple aircraft and multiple ground weapon systems.

Scope of Conflict: Conventional Red and Blue weapons systems.

Mission Area: Anti-armor, close air support, airlift, direct fire weapons.

Level of Detail of Processes and Entities: Calculates the probability of Attrition Kill, Forced Landing, and Mission Abort as well as aircraft and troop losses for air participants; mobility, firepower, and combined mobility-fire power damage levels for ground targets.

CONSTRUCTION:

Human Participation: Not required.

Time Processing: Dynamic with time steps.

Treatment of Randomness: Expected value deterministic.

Sidedness: Two-sided symmetric.

LIMITATIONS: Fixed flight paths for a given run, maximum of 32 aircraft independent paths (with-out changing dimensions), maximum 1000 ground weapon systems, no continuous movement of ground systems (multiple "snapshots" are used).

PLANNED IMPROVEMENTS AND MODIFICATIONS: Incorporation of Air Defense Network (ADNET), Command, Control Communication, Intelligence, Prioritization (C3IP) Links, square kilometer Grid (read-in optimization) in Terrain Database.

INPUT: Interactive input routine, Ground weapon characteristics and location, aircraft characteristics (flight path, weapon systems, vulnerable areas, speed, etc.), digitized terrain (with vegetation) DMAHTC, radar detection, countermeasures (warning receivers, jammers), SAM Pk's, aircraft signatures.

OUTPUT: Time history of engagement (firings and subsequent kill damage, etc), assessment of air and ground losses, number of rounds and missiles fired, dynamic graphics mission portrayal.

HARDWARE AND SOFTWARE:
Computer: Alliant, CRAY XMP, CRAY II, Interactive EVADE Input Routine, Dynamic Graphics Output Routine.
Storage: Program: Approx. 677 kilobytes.
Peripherals: Graphics terminal, PC for interactive version.
Program Language: FORTRAN.
Documentation: Users manuals available. (need updated)

SECURITY CLASSIFICATION: SECRET. Model and data base are SECRET.

GENERAL DATA:
Data Base: Dependent on available input data - 1 day to 2 weeks.

CPU Time per Cycle: Dependent on data base size and player configuration. Can take from 1-2 minutes to several hours for largest scenarios.

Data Output Analysis: 5 min. to several hrs. depending on level of analysis and desired complexity of scenario.

Users: Past users include AVRADCOM, St. Louis, MO; AMSAA, Aberdeen Proving Ground, MD; Ketron Inc., Towson, MD; NAD, Crane, IN; CIA. Currently AMSAA and Ketron are active users.

TITLE: Extended Directed Energy Combat Simulation (EDECSIM)

DATE IMPLEMENTED: 1989

MODEL TYPE: Analysis.

PROPONENT: OSI Dept, Defence Research Agency, Fort Halstead, Sevenoaks, England.

POINT OF CONTACT: Mr D.F. Wardleworth, 0959 532222, ext 3388.

PURPOSE: Study of Effectiveness of forces equipped with conventional and novel DF weapons and smart munitions.

DESCRIPTION:

Domain: Land, including rotary wing aircraft and low level air defence.

Span: There is no hard upper limit terrain size nor on numbers of units represented. Several hundred units on an area 20km square have been studied.

Environment: Terrain height and vegetation/building cover are modelled to a horizon resolution of 100m. Obscuration, poor visibility and TI sensors can be represented but pyrotechnic illumination and other night viewing enhancements are not currently modelled.

Force Composition: EDECSIM is two-sided and represents the essential characteristics of vehicle borne and certain dismounted weapons. Infantry and fixed wing aircraft are not represented.

Scope of Conflict: Conventional weapons; other systems may be accommodated by program by program modification if suitable data is available.

Mission Area: Normal study parameters include attrition, assessment of assault success and enemy observation are also possible.

Level of Detail of Processes and Entities: Individual vehicles are represented and a variety of surveillance and engagement tactics can be selected. Vehicle routes are prespecified although a limited number of responses to battle development are possible. Smart munition missions are controlled by an autonomous module which deduces viable targets from observer reports; this module includes limited representation of communications. Obscuration, conventional artillery and minefields are also represented.

CONSTRUCTION:

Human Participation: None, but scenarios are based on man-in-the-loop wargames.

Time Processing: Event sequenced.

Treatment of Randomness: Stochastic.

Sidedness: Two-sided, sides are interchangeable with no limits on size, apart from overall constraints.

LIMITATIONS: Excessive divergence from the source wargame must be avoided. Large and intense battles demand appreciable computer resources.

PLANNED IMPROVEMENTS/MODIFICATIONS: Defensive Aids Suites will be represented.

INPUT: Terrain data, unit detectability, weapon systems data including ranges, times of flight, rates of fire and lethality; deployments, routes and tactical responses including sensor usage rules; obscuration, minefield and artillery data.

OUTPUT: Overall attrition, inter-unit effectiveness by type, detections and engagements by time and range individual unit interactions, area analysis by side and by status (live/dead); plots of unit positions. Graphics playback of individual replications allow interrogation of vehicles or ground-mounted GW units to determine status and activity at any time.

HARDWARE AND SOFTWARE: (for VAX; a Cray version is also available.)

Computer: DEC VAX 8700 or 785; GPX-II required for graphics.
Storage: (Blocks) - for 29-minutes scenario, input, 7000 output, 2000; graphics, 47000.
Peripherals: A suitable terminal, printer and plotter.
Programming Language: Mainly VAX Pascal, some FORTRAN 77.
Documentation: Functional Specification, Data Requirements Specification; User Guide, Executive Summary.

SECURITY CLASSIFICATION: UK CONFIDENTIAL.

GENERAL DATA:
Data Base: Scenario preparation time: transfer time from JANUS (DRA OS1 Battlegroup Wargame, BGWG) 4 man-weeks-plus (depends on scenario and extent of data revision).

CPU Time per Cycle: Depends on scenario; a Main defensive Action with 154 units required 18 minutes CPU per minute of battle when run on a VAX 785; typically 10 replications are run per case.

Data Output Analysis: See OUTPUT.

Frequency of Use: 2-3 major and 2-3 minor studies per year.

Users: Combat Simulation Section, OS1 Dept, Defence Research Agency, Halstead.

Comments: EDECSIM is constantly being developed and refined both to accommodate new concepts and to introduce appropriate levels of realism. A library of representative scenarios is being built up in order to permit studies to be performed with minimal delay. Scenarios are normally derived from OS1 BGWG thus providing a high degree of military expertise in OA studies.

TITLE: Fire Support Command and Control Analysis Tool (FISCCAT)

DATE IMPLEMENTED: 1987

MODEL TYPE: Analysis

PROPONENT: U.S. Army Materiel Systems Analysis Activity (AMSAA)

POINT OF CONTACT: Director, USAMSAA, ATTN: AMXSY-CC (Mr. Peter Norman), Aberdeen Proving Ground, MD 21005-5071, DSN 298-6541 or Comm 301 278-6541

PURPOSE: A research and evaluation tool for use during system development and to estimate system effectiveness. The FISCCAT model was designed to aid in the evaluation of the item level performance of the Advanced Field Artillery Tactical Data System (AFATDS). It focuses on the message processing required within the fire execution mission.

DESCRIPTION: FISCCAT is a one-sided, discrete events simulation. The stimulus for the model is a list of targets of opportunity. FISCCAT was designed with flexibility in mind -- both force structure and network characteristics can be easily changed to examine different configurations of artillery command and control.

Domain: Land.

Span: Regional (any region).

Environment: Not applicable.

Force Composition: Artillery command and control within a maneuver brigade supported by Direct Support and Reinforcing Battalions.

Scope of Conflict: Any level that includes artillery command and control.

Mission Area: Indirect artillery command and control and sensors.

Level of Detail of Processes and Entities:

Entity: Artillery command and control within a maneuver brigade supported by Field Artillery battalions.

Processes: Targets introduced into the simulation trigger message traffic by the node that "acquires" the target. Subsequent message traffic results as the target is processed. While the model accounts for representative time for batteries to fire missions, the model does not include the results of weapon fire and so provides measures of performance rather than effectiveness.

CONSTRUCTION:
Human Participation: Not permitted.

Time Processing: Dynamic, event step.

Treatment of Randomness: Stochastic or deterministic, depending on data availability and study purpose.

Sidedness: One-sided.

LIMITATIONS: Assumes Perfect Communications; Nodes 100% Available; Mission Characteristics Not Dynamic (i.e., they are input); Represents Only Brigade Slice of Fire Support Assets; Unlimited Amount of Ammunition Played.

PLANNED IMPROVEMENTS/MODIFICATIONS: Add division assets, and more sensors.

INPUT: Force Structure; Communications Net Structure; Processing Times (Device and Operator); Fire Request File.

OUTPUT: Fire Mission Data (detailed data on fire missions requested, those completed, and those rejected); Fire Unit Data (hourly summary of fire unit usage); Net Utilization Data.

HARDWARE AND SOFTWARE:
Computer (OS): SUN (UNIX), Gould (UNIX), 11/785 (VMS)
Storage Required: 10 Megabytes of Hard Disk
Peripherals: None
Programming Language: SIMSCRIPT
Documentation: AMSAA Tech Rept 510 - Oct 91 describes V&V performed on FISCCAT.

SECURITY CLASSIFICATION: (Model without data) UNCLASSIFIED.

GENERAL DATA:
Data Base: Eight man-weeks to develop new force structure input

CPU Time per Cycle: 10 to 60 minutes for 20 hours battle with 20 to 180 targets per hour

Data Output Analysis: Several weeks depending on study complexity.

TITLE: First Battle: Battalion through Corps (FB: B-C)

DATE IMPLEMENTED: 11/10/89

MODEL TYPE: Training and Education

PROPONENT: U.S Army Combined Arms Command - Training, ATIN: ATZL-CTS Ft. Leavenworth, KS 66027

POINT OF CONTACT: CPT John Hughes, ATZL-CTS-BB, DSN: 552-3189 USACAC-Training, Ft. Leavenworth, KS 66027

PURPOSE: FB: B-C trains unit commanders and staffs in the the control and coordination of combined arms operations in a simulated combat environment. Exercises a unit's tactical SOP's.

DESCRIPTION:
DOMAIN: The model plays land, air and sea.
SPAN: Any map - theater to local.
ENVIRONMENT: Played on standard maps. Plays day/night. Models roads, bridges, cities and obstacles.
FORCE COMPOSITION: Any force.
SCOPE OF CONFLICT: Plays all weapon systems including NUC/CHEM.
MISSION AREA: Conventional force to corps.
LEVEL OF DETAIL OF PROCESSES AND ENTITIES: Army to single soldier.

CONSTRUCTION:
HUMAN PARTICIPATION: Human participation required for decisions and to process model.
TIME PROCESSING: Static.
TREATMENT OF RANDOMNESS: Stochastic, Monte Carlo.
SIDEDNESS: Two-sided, asymmetrical.

LIMITATIONS: No graphics or terrain representation. Depends on map board and unit counters. Is game turn dependent.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Update user and training documentaion.

INPUT: Movement/critical orders, unit names/locations, resupply, scenario.

OUTPUT: Conflict resolution, Battle Dammages, personnel and logistics, loses and reports.

HARDWARE AND SOFTWARE:

COMPUTER (OS): IBM compatible PC. MS DOS

STORAGE: 10 megabyte hard disk with a minimum of 5 megabytes free.

PERIPHERALS: Epson-type printer.

PROGRAMMING LANGUAGE: Turbo Pascal

DOCUMENTATION: Istallation guide, Basic Rules and Supplements for play.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 1 day.

CPU TIME PER CYCLE: unknown

DATA OUTPUT ANALYSIS: N/A

USERS: Commanders and staffs, battalion through corps.

TITLE: Force Analysis Simulation of Theater Administrative and Logistics Support (FASTALS) Model

DATE IMPLEMENTED: 1971

MODEL TYPE: Analytical

PROPONENT: U.S. Army Concepts Analysis Agency
Attn: Force Directorate
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Mr. Raymond G. McDowall, (DSN) 295-5264 or (301) 295-5264.

PURPOSE: The objective of FASTALS is to develop the balanced, time-phased support force requirements for a specified combat force. FASTALS is used primarily for force planning studies and analysis generally in the context of the Defense Guidance Illustrative Planning Scenario (DGIPS).

DESCRIPTION:

Domain: Land

Span: Each run accommodates one theater with a specified combat force in a combat scenario.

Environment: Theater dependent

Force Composition: Specified by study sponsor and used to generate requirements for Army logistical units.

Scope of Conflict: N/A

Mission Area: FASTALS is a deterministic computer program that was developed to generate the time-phased Army support requirements that result from a given combat simulation.

Level of Detail of Processes and Entities: Support requirements are generated for each unit type (functional area) including engineer, chemical, medical, transportation, ordnance, quartermaster, et al, by Standard Requirements Code (SRC). The workload requirements needed to sustain the forces are also generated and displayed workloads include maintenance, construction, supply consumption, transportation, patient care, personnel replacement, and other.

CONSTRUCTION:

Human Participation: All inputs are developed by functional area analysts prior to model execution. No interaction is permitted during model execution.

Time Processing: Dynamic time-step

Treatment of Randomness: Determination

Sidedness: One-sided

LIMITATIONS: No attrition to support units or retrograde movement operations; single movement of units and supplies from point of arrival to destination.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Continue to develop routines to facilitate and enhance data entry and retrieval.

INPUT: The following data base in magnetic tape form and used. Military Traffic Management Command weights file, Army MARC Maintenance Data Base, Force Accounting System unit data, and Consumption factor data (provided on floppy disks) from the U.S. Army Logistics Center.

OUTPUT: Force listing is in the form of a time-phased troop list indicating unit requirements by SRC.

HARDWARE AND SOFTWARE:
Computer: UNISYS 1100/84, Macintosh
Storage: 1.5 megabytes
Peripherals: Two 9-tract, 6250-byte-per-inch tape drives
Language: FORTRAN-77
Documentation: User's Manual and Programmer's Guide

GENERAL DATA:
Data Base: One man-month or more depending on size of force and complexity of theater being evaluated

CPU Time Per Cycle: Thirty minutes

Data Output Analysis: Two weeks or more depending upon theater

Frequency of Use: Used approximately 30 times per year for record runs.

Users: USACAA, U.S. Army Logistics Center, U.S. Army Logistics Evaluation Agency

Comments: This mode has been used for 20 years to develop the support force requirements for the Army and is accepted as the standard by which other models are measured.

TITLE: Force Evaluation Model (FORCEM) DATE IMPLEMENTED: 1985

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Dr. R. Johnson, (DSN) 295-1593 or (301) 295-1593

PURPOSE: The model provides simulation of airland activities in a theater of operations over an extended period (up to 90 days). Combat operations are at the division level and most of the combat support and combat service support functions from the port to FLOT are represented. It is a fully computerized simulation for application in studies and analyses of force planning and resource allocation issues. The model is the theater component of a three-level hierarchy of Army simulation models (at Battalion, Division/Corps and Theater) developed under the Army Model Improvement Program.

DESCRIPTION:
Domain: Land - air

Span: Theater campaign. Current data bases are Central Europe, and Southwest Asia.

Environment: Terrain square of selectable size (5-30km). Eight terrain types, including urban and water areas, affecting movement. Day and night difference for some operations. No weather. Road, rail and water transport represented, as well as pipeline for fuel networks.

Force Composition: Joint and combined forces. Blue and Red. Blue force partitioned into two components for resource accounting purposes.

Scope of Conflict: Primarily conventional. Chemical module operational and nuclear module under development.

Mission Area: Theater ground operations with fire support (including air) and combat service support, including medical, maintenance, supply, and transportation functions.

Level of Detail of Processes and Entities: The level of resolution of combat units is the division. Combat support and combat service support operations are represented by a single support command at each division, corps, army group, and theater representing all combat service support activities. Functional submodels represent the major activities of target acquisition, communications, command and control, division engagement, fire support, air operations, unit movement and combat service support. As an average value simulation, without player interaction, command and control is represented by automated decision processes at three

levels in the theater (Corps, Army Group, Theater). Assessment of division battle is made through an analytic representation of a division engagement with sets of attrition coefficients calibrated to the results of engagements simulated by an independent division model. Air operations are represented by groups of aircraft, by mission (eight possible), in an air sector (roughly Corp or Army) or, in a few cases, theater-wide. Area air defense is considered at the same air sector level.

CONSTRUCTION:

Human Participation: Model is interruptible, mostly for purposes of command and control to change unit boundaries and phase lines or air role apportionment factors. Scheduled changes also allowed.

Time Processing: Dynamic, time step model with twelve hour time cycle

Treatment of Randomness: Deterministic, without randomness in the model. Some inputs are expected values generated from stochastic processes.

Sidedness: Two sided, generally symmetric. Command and control input data may be varied by national component on each side to represent different decision factors.

LIMITATIONS: No naval operations, weather, engineer functions, EW or rear area combat. Highly aggregated intelligence and communications.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Presently revising nuclear/chemical representation and command and control and engagement process for asymmetric representation of Blue and Red operations and for better representation of breakthrough and reserve and second echelon force employment. Upgrades to intelligence/target acquisition and addition of engineer functions planned.

INPUT:

- In-theater force-units and their assets
- Arrival schedule-units and assets
- Theater scenario and plans
- Terrain
- Engagement results from division level simulation
- Weapons and equipment characteristics
- C^2 decision criteria
- Performance factors for surveillance, communications, repair, medical, transport, etc., functions

OUTPUT:

- Computer reports, giving status, losses, and expenditures of units and assets over time
- Computer graphics graphs and map displays
- Hard copy plots and charts

HARDWARE AND SOFTWARE:
Computer: UNISYS 1100/84, SUN 4/260, Cray 2
Storage: One to three million decimal words, depending on scenario
Peripherals: Disk storage, demand CRT terminal, computer graphics terminal and plotter for input and output preparation, tape unit for checkpoint/restart capability
Programming Language: SIMSCRIPT II.5
Documentation: FORCEM Input Data, October 1990; FORCEM Output Reports, September 1991.

SECURITY CLASSIFICATION: UNCLASSIFIED, without data

GENERAL DATA:
Data Base: Three to six months required to build new data base from scratch

CPU Time Per Cycle: Depends on scenario. Average of 15-20 minutes per twelve hour cycle on UNISYS 1100.

Data Output Analysis: Highly variable, depending on study. Large volume of output is reduced, combined and manipulated by a post processor information retrieval system (UNISYS MAPPER).

Frequency of Use: Two per year for major studies

Users: Used only at the U.S. Army Concepts Analysis Agency

Comments: Model operates in hierarchical mode and is dependent on results from higher resolution division model (presently COSAGE) for combat attrition and munition expenditures.

TITLE: General Full Spray Materiel/Personnel Mean Area of Effectiveness - MAE (AKA Lethal Area Program)

DATE IMPLEMENTED: 1979 (JTCGME Version).

MODEL TYPE: Analysis.

PROPONENT: U. S. Army materiel Systems Analysis Activity, Ground Warfare Division, Support Warfare Analysis Branch, Aberdeen Proving Ground, MD 21005-5071.

POINT OF CONTACT: Russell Dibelka, DSN 298-5046 or (301) 278-5046.

PURPOSE: The Lethal Area Program is used to analyze item level performance by computing the lethality of one conventional weapon against one materiel or personnel target.

DESCRIPTION:

Domain: Surface-to-surface, air-to-surface.

Span: Individual (Item).

Environment: Open environment is the default condition. The environmental shielding of the target option allows a choice of tropical forest, temperate forest, jungle tangle, and coniferous forest. Another option allows the effect of tall grasses on projectile drag to be evaluated. Personnel targets are assessed in four postures: standing, prone, prone protected, and crouching in a foxhole.

Force Composition: One-on-one, Red and Blue.

Scope of Conflict: Indirect fire weapons such as unitary warheads, submunitions, flechettes, mortars, bombs, laser-guided munitions, and terminally-guided munitions.

Mission Area: Fire Support and Close Combat Light (mortars only).

Level of Detail of Processing and Entities: The only entity modelled is an individual weapon versus an individual target. No processes such as attrition, communications, and movement are modelled.

CONSTRUCTION:

Human Participation: None required not permitted.

Time Processing: Static.

Treatment of Randomness: None.

Sidedness: One-sided.

LIMITATIONS: The effects of blast on the target and a direct hit on the target cannot be modelled simultaneously. Multiple critical components (i.e., site kills) cannot be modelled. Lethal area is calculated for only one submunition (bomblet), not the entire payload.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Link input and output dir directly to Fire Support data base.

INPUT: Weapon characteristics and fragmentation data, target vulnerability data.

OUTPUT: Computer printouts containing input data and lethal areas. Options permit calculation and printouts of other measures of effectiveness (PKs, CEP's, etc).

HARDWARE AND SOFTWARE:
Computer (OS): Alliant computer UNIX-type operating system (AMSAA Version); Cyber Computer with NOS operating system (JTCG/ME version).
Storage: .36 megabyte (FORTRAN code only).
Peripherals: Printer.
Programming Language: FORTRAN V.
Documentation: Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME manuals).

SECURITY CLASSIFICATION: Model is UNCLASSIFIED, however, input and output are usually classified up to SECRET/NOFORN.

GENERAL DATA:
Data Base: New fragmentation data (primarily from arena testing) can take several man-months after testing is completed to be made available. New target vulnerability data (primarily developed by the Ballistic Research Laboratory) can take one man-year. To set up an input file for one weapon/target combination with existing fragmentation and vulnerability data from the Fire Support data base takes a few minutes.

CPU Time Per Cycle: Usually less than five minutes and frequently less than one minute.

Data Output Analysis: Input data are printed for verification purposes. Lethal area output is used as input to the ARTQUIK model as well as several higher models. However, there is no direct linkage between the models nor specific analysis of the lethal area output.

Frequency of Use: Varies with the number of studies being supported, but probably several hundred times throughout the year.

Users: AMSAA, OSU-Field Office (JTCG/ME version), DoD contractors, other DoD agencies.

Releasability: Military Use Only.

TITLE: Groundwars

MODEL TYPE: Analysis.

PROPONENT: U. S. Army Materiel Systems Analysis Activity, Attn: AMXSY-GC, Aberdeen Proving Ground, MD 21005-5071.

POINT OF CONTACT: Michael Schmidt, DSN: 298-4413 or 410-278-4413.

PURPOSE: Groundwars is primarily used to evaluate weapon system effectiveness. The model can address ammunition expenditures, target acquisition, delivery accuracy, vulnerability, lethality, rate of fire, disengagement policies, effect of line-of-sight due to terrain or obscurants, and the effect of various round types (KE, HEAT, guided missiles, fire and forget missiles).

DESCRIPTION:

Domain: Land combat.

Span: Any regional area depending on data base.

Environment: Terrain and obscuration dictated by input.

Force Composition: Individual weapon systems in a combined force.

Scope of Conflict: Conventional direct fire.

Mission Area: Conventional direct fire land missions.

Level of Details of Processes and Entities:

Entity: Single weapon system or infantry soldier.

Processes: Movement by attackers, attrition assessed by probability of kill and Monte Carlo theory.

CONSTRUCTION:

Human Participation: None.

Time Processing: Dynamic, event stepped.

Treatment of Randomness: Monte Carlo theory, stochastic.

Sidedness: Two-sided, symmetric.

LIMITATIONS: Groundwars simulates only one weapon system and one acquisition sensor per platform. The total number of combatants is limited to 100.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Multiple weapons and sensors per platform. Graphical interface for output analysis.

INPUT: Scenario, firing times, probability of kill, sensor performance data, platform description, etc.

OUTPUT: Computer files and printouts.

HARDWARE AND SOFTWARE:
Computer/Operating Systems: Sun, GOULD 9080, CRAY, Alliant, VAX-11/780.
Storage: 200K.
Peripherals: None.
Programming Language: FORTRAN 77.
Documentation: AMSAA DRAFT Technical Report "Groundwars 5.0 User's Guide."

SECURITY CLASSIFICATION: UNCLASSIFIED.

GENERAL DATA:
Data Base: Scenario dependent - approximately three weeks. Creation of input files: one week. Analysis of output: one week.

CPU Time per Cycle: FHX Alliant - 30-90 seconds per replication.

Frequency of Use: Continuous.

Users:
Government Agencies: USAMSAA, U. S. Army Missile Command, U.S. Army Armor School, Army Tank Automotive Command, Program Chassis/Block III, Air Force Air University
Contractors: General Dynamics Land Systems, Dynetics Inc., Booz-Allen and Hamilton, Inc, Analysis and Simulation Inc., Armored Vehicle Technologies Associated, Hercules Defense Electronics Systems Inc., Nomura Enterprises Inc., Teledyne Brown Engineering

TITLE: Helicopter Air-to-Air Combat Simulation - HATACS

DATE IMPLEMENTED: September 1978.

MODEL TYPE: Analysis.

PROPONENT: U.S. Army Materiel Systems Analysis Activity, Attn: AMXSY-AAG, Aberdeen Proving Ground, MD 21005-5071.

POINT OF CONTACT: William Nicholson, DSN 298-6403 or (410) 278-6403.

PURPOSE: HATACS is used primarily to evaluate the effectiveness of Blue and Red gun systems (both current and proposed) against current and proposed air-to-air threats.

DESCRIPTION:

Domain: Air-to-air.

Span: Local.

Environment: Benign.

Force Composition: One attacker and one target aircraft.

Scope of Conflict: Aircraft Gun systems (up to 40mm).

Mission Area: Close Air Support.

Level of Detail of Processes and Entities: Calculates the probability of Attrition, Forced Landing and Mission Abort Kill categories and the probability of hitting (PH) the target.

CONSTRUCTION:

Human Participation: Not required.

Time Processing: Static.

Treatment of Randomness: Deterministic and generates a value as function of an expected value.

Sidedness: One-on-one with pseudo-duel encounter.

LIMITATIONS: One-on-one, passive target, no terrain, weather or countermeasures.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None at this time.

INPUT: Projectile trajectory characteristics, ballistic dispersion, fire control errors, gun rate-of-fire and target vulnerability.

OUTPUT: Produces printout of tables with PKs for the 3 levels of kill (Attrition, Forced Landing and Mission Abort) and PH as

HARDWARE AND SOFTWARE:

Computer: Runs on CRAY II and Alliant computers with the UNIX operating system.

Storage: 1 MB for executable program.

Peripherals: 1 printer and 1 VT100 terminal.

Programming Language: FORTRAN 77.

Documentation: Thor Informal Report, Y-95, A Description of the HATACS Computer Model, P.H. Beavers, Thor Group, Falcon Research & Development Company for AWD, AMSAA, 28 September 1978.

SECURITY CLASSIFICATION: UNCLASSIFIED, but data can be classified.

GENERAL DATA:

Data Base: Time needed to create one complete weapon-target combination is 4 hours.

CPU Time per Cycle: For a complete set of ranges, kill categories, and target aspects 25 minutes on CRAY II or 4 hours on Alliant.

Frequency of Use: Varies, but is used several times per year in all data request from Army commands for item level performance data.

TITLE: Helicopter Launched Missile Antitank Effectiveness Simulation - HELMATES II

DATE IMPLEMENTED: August 1990.

MODEL TYPE: Analysis.

PROPONENT: U.S. Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD 21005-5071.

POINT OF CONTACT: Rosemary M. Mirabelle, DSN: 298-6394 or (410)-278-6394.

PURPOSE: To analyze helicopter weapon systems effectiveness and weapon mix effectiveness in a combat environment.

DESCRIPTION:

Domain: Air-to-ground/ground-to-air.

Span: Attack helicopter company vs. ground battalion.

Environment: Terrain features, weather and time of day.

Force Composition: Attack helicopter company vs. ground battalion.

Scope of Conflict: Conventional.

Mission Area: Close air support.

Level of Detail of Processes and Entities: Individual aircraft or ground vehicle is lowest entity. Processes: attrition, communications, and movement effects above entities.

CONSTRUCTION:

Human Participation: Not required.

Time Processing: Dynamic (event sequenced).

Treatment of Randomness: Stochastic, both Monte Carlo and direct computation.

Sidedness: Force on force.

LIMITATIONS: Blue aircraft only (attack and scout). Red threat limited to 200 vehicles.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Yes, develop new scenarios, update with latest night vision detection model.

INPUT: Scenarios, weapon characteristics, time lines.

OUTPUT: Killer victim scoreboards, battle time, average exposure times, and kill rates.

HARDWARE AND SOFTWARE:
Computer: CRAY II, VAX.
Peripherals: Input device, printer.
Programming Language: FORTRAN.

SECURITY CLASSIFICATION: UNCLASSIFIED.

GENERAL DATA:
Data Base: One week to three months.

CPU Time per Cycle: Ten seconds.

Data Output Analysis: One day.

TITLE: Helicopter Scenario Assessment Model - HELSCAM

DATE IMPLEMENTED: 1989.

MODEL TYPE: Analysis.

PROPONENT: Directorate of Land Operational Research (DLOR), Operational Research and Analysis Establishment (ORAE), Ottawa, Canada K1A 0K2

POINT OF CONTACT: Dr. P.J. Young, (613) 992-4567 or DSN 842-4567.

PURPOSE: To analyze the value of helicopter system and sub-system characteristics and configurations in light observation, light armed, and attack roles within realistic "few-on-few" tactical scenarios.

DESCRIPTION:

Domain: Land and Air.

Span: Local. HELSCAM is a "few-on-few" class of simulation.

Environment: On and over three dimensional terrain covering approximately 1000 square km in Europe. Designed for mixed open/forested terrain. Accommodates varying visibility and weather conditions.

Force Composition: Helicopter systems, air defences, and ground combat vehicles of all major types. Individual soldiers can be represented.

Scope of Conflict: Conventional direct fire systems only.

Mission Area: Light observation, armed reconnaissance, and attack helicopter missions in contact with the enemy. Can also simulate scenarios involving only conventional direct fire vehicles and systems.

Level of Detail of Processes and Entities: Vehicles and weapon systems are represented individually. The engagement sequence of each sensor/weapon system is modelled on an event-by-event basis, including the processes of target acquisition, target selection, target engagement, damage recognition, and re-engagement. Kill probabilities are drawn from look-up tables. Communication of target acquisition and destruction information between units on the battlefield is represented. Each system follows a prescribed path, but can advance (or retreat) along that path at a rate determined by events.

CONSTRUCTION:

Human Participation: NOT REQUIRED. Model is an automated simulation.

Time Processing: Dynamic. HELSCAM is completely event stepped.

Treatment of Randomness: Stochastic. Monte Carlo.

Sidedness: Two-sided, symmetric.

LIMITATIONS: Units follow prescribed paths, placing a practical upper limit of approximately 30 systems total on both sides and approximately 30 minutes of combat. Shoot-look-shoot engagements only. Unit information never incorrect, only incomplete. Digital terrain data base fidelity limits capability to play out close combat scenarios completely within forested or urban areas. Suppression, training, and morale effects not modelled.

PLANNED IMPROVEMENTS/MODIFICATIONS: Under contract, HELSCAM is being rewritten into C++ and being ported onto a single IBM/PC compatible platform. The representation of ground vehicles will be enhanced to the level of the helicopters in the model, at which time HELSCAM will be renamed the Combat Scenario Assessment Model (COMSCAM).

INPUT: Terrain data in two forms: 100 meter resolution digital terrain elevation and vegetation height data; and 12.5 meter resolution digital terrain classification data. Technical parameters of sensors, weapons, and platforms, including PK tables and target selection priority tables. Also, scenario parameters including unit paths, procedures and tactics.

OUTPUT: Event log, which can be listed from a rudimentary analysis facility, or viewed from a fully developed graphical replay facility.

HARDWARE AND SOFTWARE:

Computer(OS): HELSCAM simulation core and analysis facility runs on a VAX/VMS system. Route planning and graphical replay facilities run on an IBM PC/AT clone with the Verticom M-256E graphics card. Eventually, the core and all utilities will run on a standard VGA-enhanced IBM PC.

Storage: Simulation core uses 3 MB of memory. 12 MB of disk space is desirable to accommodate terrain, input and multiple output files.

Peripherals: Printer, Verticom monitor, Microsoft mouse.

Programming Language: Simulation core in VAX FORTRAN. Graphical Replay and Route Planning facilities written in Microsoft C and Assembler.

Documentation: ORAE Project Reports PR488, PR489. DLOR Staff Notes 89/5, 89/6, 89/8, 89/9, 89/10, 89/11, and 89/12.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA:

Data Base: Several person-weeks to enhance existing data base and develop scenario inputs. Several person months to populate a data base from scratch.

CPU Time per Cycle: Approximately 5 minutes of CPU time on a VAX 11/751 to simulate 30 minutes of combat for 8 units.

Data Output Analysis: Variable, from several hours to several days.

Frequency of Use: Applied periodically (several times annually) in helicopter or direct fire studies.

Users: ORAE/DLOR staff in support of Army study sponsors.

Comments: JANUS, TAM, and HELSCAM are the primary combat models employed in ORAE/DLOR operational research studies.

TITLE: INTELLIGENCE ELECTRONIC WARFARE FUNCTIONAL AREA MODEL (IEWFAM)

DATE IMPLEMENTED: 03/01/91

MODEL TYPE: ANALYSIS

PROPONENT: U.S. ARMY INTELLIGENCE CENTER, Fort Huachuca, AZ 85631-7000

POINT OF CONTACT: PAMELA KILEY, ATSI-CDC-S, DSN: 879-7212/7213
Fort Huachuca, AZ 85631-7000

PURPOSE: The IEWFAM is a mid-level resolution, VIC based, combat simulation that portrays intelligence functions in terms of collection management, sensors, processing, and jamming. The model supports Combat Development activities in terms of evaluating new doctrine and competing strategies. The IEWFAM is a Research and Evaluation Tool which evaluates sensor, processor, and jammer effectiveness against target sets. The model evaluates IEW force capability and requirements in terms of mix effectiveness.

DESCRIPTION:
DOMAIN: The IEWFAM evaluates sensor contribution in land, air, & space.
SPAN: The IEWFAM is a corps level model. The contribution of theater assets is evaluated in an aggregated fashion.
ENVIRONMENT: The IEWFAM utilizes the same 4km terrain hexes utilized by the VIC model. Both day and night is represented, and weather is represented to a limited degree.
FORCE COMPOSITION: The model plays a blue corps against a red army. Combined or joint forces are not specifically represented, but could be.
SCOPE OF CONFLICT: The IEWFAM evaluates a conventional scenario. The chemical and biological module can either be turned on or off depending on the desired level of detail.
MISSION AREA: ECM, Collection, Collection Mgmnt, & Processing & Analysis.
LEVEL OF DETAIL OF PROCESSES AND ENTITIES: Units are usually represented at the battalion level. A piece of equipment (sensor) can be represented, but it is associated with a parent unit for processes such as attrition and movement. Flight profiles of specific air vehicles are explicity represented.

CONSTRUCTION: HUMAN PARTICIPATION: Not required once the simulation has initiated. An interrupt mode has been built into VIC, but it is not normally used when running the IEWFAM. The model is event-driven and changes occur based on an external events file and internal events.
TIME PROCESSING: IEWFAM is an Event-Stepped, Dynamic model.
TREATMENT OF RANDOMNESS1 IEWFAM is a Deterministic model which generates a value as a function of an expected value.
SIDEDNESS: The IEWFAM is a two-sided model in which all processes are represented for both sides, but data inputs can be varied.

LIMITATIONS: IEWFAM validation is still ongoing.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Planned improvements include: facilitating scenario changes, the inclusion of HUMINT representation through AI means and parrellization of processing to speed up run times.

INPUT: The IEWFAM is extremely data intensive. In addition to the data required for the combat portions of VIC (scenario, weapons, units etc.) intelligence specific data include: requirements nodes, detectables,

detectable thresholds, sensor parametric data, processing ques and thresholds, and initial perceived threat.

OUTPUT: The output is available on magnetic tape which is loaded into an Ingres data base which is part of the IEWFAM post processor. The post processor allows the user to access the data through preprogrammed queries or through adhoc SQL commands. The data can be displayed in tabular format, in relation to a map background, or in common business statistical format.

HARDWARE AND SOFTWARE:

COMPUTER (OS): SUN IV/WP/UNIX

STORAGE: Minimum storage requirement is approximately 2 gigabytes

PERIPHERALS: Color graphics monitor or large screen projection system and printer as desired.

PROGRAMMING LANGUAGE: SIMSCRIPT

DOCUMENTATION: Limited documentation is available. Documentation cycle is not yet complete.

SECURITY CLASSIFICATION: The code is unclassified, but the input data is at the secret level and can be upgraded to the SCI level.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Force laydown one man month. System characteristics 1/2 man month.

CPU TIME PER CYCLE: Model currently running approximately 10:1 for limited periods. Hardware RAM drives run time.

DATA OUTPUT ANALYSIS: TBD.

FREQUENCY OF USE: Model is currently being used daily. Expect heavy usage for study support once validation is complete.

USERS: Intelligence Center is the primary user. TRAC-OAC is using the model to support some studies.

COMMENTS: IEWFAM is closely linked to VIC. IEWFAM cannot run as a stand alone model without the VIC combat driver. Changes to VIC code must be incorporated as they occur.

TITLE: Janus-Army (JANUS-ARMY)

DATE IMPLEMENTED: 10/01/90

MODEL TYPE: ANALYSIS and TRAINING AND EDUCATION

PROPONENT: TRADOC Analysis Command (TRAC-WSMR), White Sands Missile Range, NM

POINT OF CONTACT: Charles Lee Kirby, ATRC-WEB, (505)678-4949, DSN: 258-4949

PURPOSE: Janus-Army has been developed primarily as an analysis tool to support Cost and Operational Effectiveness Analyses, analysis of tactics and doctrine and other Army studies. It is also used as a high resolution scenario generator, GDP evaluator, and CPX driver. Janus-Army development has also responded to the requirement to use the game as a seminar and classroom educational tool for company, battalion and brigade commanders.

DESCRIPTION:
DOMAIN: Land, air and naval support of land operations
SPAN: Individual system through brigade force
ENVIRONMENT: Time of day, DMA digitized terrain topography, weather conditions, terrain surface features include vegetation, bodies of water, cities, roads and rivers, obscuration, obstacles, and non-persistent chemicals.
FORCE COMPOSITION: Joint and combined forces for both RED and BLUE.
SCOPE OF CONFLICT: RED and BLUE conventional, some chemical and some unconventional weapons.
MISSION AREA: Combined Arms Combat including CAS, airlift, ground maneuver and indirect fire weapons.
LEVEL OF DETAIL OF PROCESSES AND ENTITIES:
ENTITIES: All engagements are resolved at the individual system or soldier level. Units can be homogenously aggregated to expedite play.
PROCESSES: Janus-Army processes are stochastic. The environment, search and detection, and attrition processes are modeled at the highest level of resolution possible within the constraints of data and hardware.

CONSTRUCTION:
HUMAN PARTICIPATION: Required for decisions and processes. The game does not wait for a decision to be made.
TIME PROCESSING: Dynamic, time preserving event stepped model.
TREATMENT OF RANDOMNESS: Stochastic: a combination of direct computation and monte carlo techniques.
SIDENESS: Two sided, asymmetric, with both side capable of reacting.

LIMITATIONS: 600 units per side. Units must be homogeneous, one or more systems.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Offer the game on UNIX comp & X-Windows graphics platforms. Incr/impr representation battlefield phenomena; simplify data base input; & allow heterogeneous aggregate units.

INPUT: Static - Weapon and system operational characteristics, weapons effects, sensor performance(weather dependent), radar performance vs a/c, terrain, smoke and dust parameters(weather dependent), chemical weapon parameters, minefield parameters and effects.
Scenario dependent - force size and composisiton, initial positions of

units, barriers and prepared positions and preplanned artillery. Dynamic - movement routes, unit states, search sectors, and artillery fires

OUTPUT: All artillery and direct fire events, all kill events, all minefields ecounters and breaching activity by unit, all detection events and all events related to heat stress, protective actions and use of chemicals are recorded on disk. The standard post processor produces summary artillery and direct fire reports, killer victim scoerboard, force loss analysis, system exchange ratios, system contribution, detection scoreboard, and engagement range analysis.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX/VMS

STORAGE: 16 Mbytes (CPU), 500 Mbytes (disk)

PERIPHERALS: 4-16 Tektronix 4225 19" color graphic terminals with 1 or 2 data tblets ea, 4-8 VT420 terminals, 1 ln printer, 2-4 tbl top printers.

PROGRAMMING LANGUAGE: FORTRAN

DOCUMENTATION: 1986 User Manual with updating memoranda.

SECURITY CLASSIFICATION: UNCLASSIFIED

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Initial preparation, 2 to 4 man months. Updates, 2 to 10 man-days.

CPU TIME PER CYCLE: CPU and sceanrio dependent - MicroVAX 4000-200 will run brigade scenarios at real time.

DATA OUTPUT ANALYSIS: Study and analyst dependent.

FREQUENCY OF USE: Continuous

USERS: Eight US Army, Ft Benning, Ft Knox, Ft Leonard Wood, Ft Rucker, Ft Sill, I Corps, SOUTHCOM, Cdrs Dev Crse, TRAC-MTRY, TRAC-SWC, etc.

COMMENTS: Inquiries for obtaining the game and supporting data bases should be addressed to TRAC-TOD, Ft Leavenworth, KS 66027-5200 or call DSN: 552-5511 or commercial (913) 684-5511.

TITLE: JANUS(BCWG) DATE IMPLEMENTED: 1988

MODEL TYPE: Analysis.

PROPONENT: OS1 Department, DRA Fort Halstead, Sevenoaks, Kent, England

POINT OF CONTACT: Is Gardner, 0959 532222 ext 2444.

PURPOSE: JANUS(BGWG) is a research and evaluation tool, dealing primarily with weapon systems development and effectiveness. It can also be used to assess force capability and requirements, dealing with courses of action, mix, effectiveness and resource planning.

DESCRIPTION:

Domain: Land and Land/Air.

Span: Local, tactical.

Environment: Digitized terrain consists of data for each terrain square, generally 50 or 100m. Terrain features include spot heights, 7 types of vegetation, 7 types of building, rivers, roads, bridges, and obstacles. The model can handle any time of day in any weather conditions.

Force Composition: Up to Brigade level.

Scope of Conflict: Conventional.

Mission Area: Any conventional missions within the domain.

Level of Detail of Processes and Entities: The lowest entities modelled are individual men, vehicles of aircraft, though men are usually grouped into small teams. Attrition, movement, target acquisition and logistics are modelled for each entity.

CONSTRUCTION:

Human Participation: Required for decisions, though the model would continue to run without a decision.

Time Processing: Processing is dynamic, and uses event stepping.

Treatment of Randomness: Stochastic.

Sidedness: Two-sided, symmetric.

LIMITATIONS: The battle is limited to a maximum of 999 units (vehicles or weapons teams) per side, and an area of 600 x 600 terrain cells. JANUS(BGWG) does not model C3I in any detail.

PLANNED IMPROVEMENTS/MODIFICATIONS: More detailed unit damage and defilade models are currently being implemented and the surveillance and target acquisition (STA) model is to be rewritten

in the near future. There are some 57 other changes planned, including complete rewrites of mobility and movement, direct fire, mines and barriers, the man-machine interface (MMI) and replay facility.

INPUT: Terrain and weather data, system and weapon characteristics including sensor, attrition and mobility data, smoke and dust data. Orders (routes and fire tactics) are input and modified by the players during play. To an increasing extent the combat model is coming under the control of input data.

OUTPUT: The progress of the battle is displayed to the players interactively during play. Unit status can be requested during the game. Records of all events (e.g., acquisitions, direct and indirect fire events, mine encounters, reloading, debussing, etc) are written to a relational data base from which views can be selected or analysis and the production of a printed record.

HARDWARE AND SOFTWARE:
Computer: DEC 11/785; VAX/VMS.
Storage: Executable 16k blocks, data 22k blocks, plus 30k blocks output data.
Peripherals: Eight Ramtek graphics terminals with tablets, VT220 terminals for textual information, color printer.
Programming Language: VAX Fortran.
Documentation: The original JANUS(T) documentation (June 1986), plus annual BGWG supplements describing all model changes which have been made. Resources have not yet allowed the production of an integrated documentation set for JANUS(BGWG), although this is planned.

SECURITY CLASSIFICATION: Software is unclassified.

GENERAL DATA:
Time Required:
Data Preparation: A few hours to several months.
Game:
Data Output Analysis: One hour to produce data base tables for each game

Frequency of Use: Continual.

Users: OS1 DRA.

Comments: JANUS(BGWG) was developed from JANUS(T). It is not compatible with the current US JANUS(A).

TITLE: Maintenance Capability Attack Model (MACATAK)

DATE IMPLEMENTED: 01/01/79

MODEL TYPE: Analysis

PROPONENT: TRADOC Analysis Command, Ft Lee (TRAC-LEE)

POINT OF CONTACT: Bruce E. Lasswell, DSN: 539-1816, Ft Lee, VA 23801

PURPOSE: This model is a research and evaluation tool used in the analysis of maintenance force capabilities and requirements. It may be used for course of action assessment and resource planning. The model is primarily used to measure the capability of maintenance elements. The model assesses the effectiveness of the maintenance system as it experiences attacks both on the end items it supports and the system itself.

DESCRIPTION: This is a stochastic, discrete event, high resolution maintenance simulation created using MAWLOGS Modeling System. It plays multi-echelon maintenance activities with explicit skills, test equipment, and DX or LRU inventories. Lift equipment and ASL-PLL-NSL parts are played generically. Repair of unscheduled maintenance actions and combat damage may be represented in detail. All transportation is implicitly represented by delay times. There is no representation of terrain features. The effect of conflict may be represented in conventional, chemical, and nuclear environments. The level of resolution is variable, with the user determining the span and force composition to be simulated.

CONSTRUCTION:
HUMAN PARTICIPATION: Not required.
TIME PROCESSING: Dynamic, event-step.
TREATMENT OF RANDOMNESS: Either stochastic, Monte Carlo or deterministic.
SIDEDNESS: One-sided.

LIMITATIONS: Data set can be extensive. Not directly related to combat models.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None.

INPUT: Number and type of equipment in each using unit; number and MOS of maintenance personnel; inventory of DX components at each maintenance activity; equipment usage rates and failure rates; maintenance action information such as time to repair, frequency of occurrence, and contact teams; time it takes for parts to arrive; scenario.

OUTPUT: Tabular printouts of probable equipment availability; listing of equipment maintenance Turn Around Time (TAT); TAT broken into function segments; printouts of queue sizes for parts, skills, and equipment as a function of time. A binary transaction file is created for additional postprocessing.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/780 (VMS), SUN 4/280 (UNIX).

STORAGE: Variable.

PERIPHERALS: Printer and tape drive.

PROGRAMMING LANGUAGE: FORTRAN 77.

DOCUMENTATION: User's Guide for MACATAK (DLSIE 41425-MA), Programers' Guide for MACATAK (DLSIE 41425-MB).

OTHER COMMENTS: MACATAK was created using the Models of the Army Worldwide Logistics System (MAWLOGS).

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: N/A.

CPU TIME PER CYCLE: Varies.

DATA OUTPUT ANALYSIS: Varies.

FREQUENCY OF USE: As needed.

USERS: Proponent; U.S. Army Combined Arms Support Command; U.S. Army Ordnance Missile and Munitions School; BDM Corporation.

COMMENTS: Government agencies can obtain MACATAK with a signed memorandum of agreement. Government Contractors with a valid contract requiring the use of MACATAK can also obtain the model with the approval of the TRAC Commanding General. Inquiries for obtaining the model and supporting data bases should be addressed to TRAC-TOD, Ft. Leavenworth, KS 66027-5200 or call DSN: 552-5511 or commercial 913-684-5511.

TITLE: Maintenance Model (MAMO)

DATE IMPLEMENTED: 01/31/91

MODEL TYPE: Analysis

PROPONENT: U.S. Army Combined Arms Support Command (USACASCOM), Ft Lee VA

POINT OF CONTACT: Dr. James Blowers, CASCOM, ATIN: ATCL-OMM, DSN: 687-3063

PURPOSE: Model the wartime operation and maintenance of wheeled vehicles in a heavy Division slice through EAC. Designed for the primary purpose of determining maintenance manpower requirements.

DESCRIPTION:
Domain - Heavy Division slice of a Corps through EAC, land only.
Span - Division slice through EAC.
Environment - Time, usage profile (stop, move, idle).
Force Composition - Wheeled vehicles.
Scope of Conflict - Conventional.
Mission Area - Weapons not modelled.
Level of Detail - Individual vehicle operation and maintenance.

CONSTRUCTION:
Human Participation - Not required, not permitted once run submitted.
Time Processing - Dynamic discrete event.
Treatment of Randomness - Deterministic, generates values based on distribution.
Sideness - One-sided.

LIMITATIONS: No geography. No combat damage.

PLANNED IMPROVEMENTS AND MODIFICATIONS: User's guide, Mar 91

INPUT: Comprehensive LIN maintenance data, usage data, force structure, part availability and delay.

OUTPUT: Annual maintenance manhours by level of maintenance by MOS by LIN. Operational availability, wait and queue length data.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/780, VMS

STORAGE: Model + data + to run = 10,000 blocks/ 500k bytes data arrays etc. virtual

PROGRAMMING LANGUAGE: Discrete Event SLAM (FORTRAN)

DOCUMENTATION: User's Guide (Mar 91), Model documentation (Jan 91)

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: as updates require

CPU TIME PER CYCLE: 4 hours 24 minutes to run 30 days

DATA OUTPUT ANALYSIS: 4 hours

FREQUENCY OF USE: as required

USERS: CASCOM, OC&S

COMMENTS: Originally developed to support MARC program.

TITLE: Medical Evacuation MARC Model (MEDEVAC)

DATE IMPLEMENTED: 02/01/91

MODEL TYPE: Analysis

PROPONENT: U.S. Army Combined Arms Support Command (USACASCOM), Ft Lee VA

POINT OF CONTACT: Gerard Petet, CASCOM, ATIN: ATCL-OMM, DSN: 687-1845

PURPOSE: This analysis provides a valid/auditable method of determining the Manpower Requirements Criteria (MARC) for medical evacuation (MEDEVAC) operations in a European, mid-intensity conflict scenario. This model provides the factors required to determine the minimum number of essential MOS 67J - Helicopter Crew Chiefs; MOS 153B/D - UH1H/UH60 Helicopter Pilots; MOS 91A - Medical Specialists; and MOS 91B - Medical NCO's that are needed to staff medical evacuation units in order to accomplish their wartime mission.

DESCRIPTION: To determine MARC requirements, a complex model was developed using the Simulation Language for alternative Modelling (SLAM). This model simulates a division slice through the Echelon Above Corps (EAC) and the patient flow from the Foward Line of Troops (FLOT) to the COMMZ Hospital using both air and ground ambulances in a wartime environment. The total operational hours per day per air and ground ambulance required for MEDEVAC were recorded by type air/ground ambulance for each level (CP, BAS, BSA, etc.). These operational hours, in addition to APMMH were used to determine MOS requirements.

CONSTRUCTION: No human participation required during simulation run. Model is interruptable, dynamic (event-step form), stochastic and two-sided (symmetric).

LIMITATIONS: Division slice of corps. 30 day - no warmups. Five air and five ground ambulances maximum.

PLANNED IMPROVEMENTS AND MODIFICATIONS: User's Guide Dec 90.

INPUT: Casualty data.
Number, speed, capacity, and maintenance requirements of air and ground ambulances.
Patient category data.

OUTPUT: Ambulance utilization operational hours.
Ambulance fill data.
Patient evaluation data.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/780

STORAGE: 3,000 blocks

PERIPHERALS: Printer

PROGRAMMING LANGUAGE: SLAM, FORTRAN

DOCUMENTATION: User's Guide, Dec 90

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 8 hours

CPU TIME PER CYCLE: 30 minutes

DATA OUTPUT ANALYSIS: 1 hour

FREQUENCY OF USE: continual

USERS: Academy of Health Sciences, CASCOM

TITLE: Micro FASTAL Date Implemented: 1987

MODEL TYPE: Analytical

PROPONENT: U.S. Army Concepts Analysis Agency
Attn: Forces Directorate
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Mr. Raymond G. McDowall, (DSN) 295-5264 or (301) 295-5264

PURPOSE: The objective of Micro FASTALS is to develop the balanced support force requirements for a specified combat force Micro FASTALS is used primarily for force in a contingency type operation Micro FASTALS was developed from the larger FASTALS model and designed to run on a personal computer using a spreadsheet format.

DESCRIPTION:

Domain: Land

Span: Each run accommodates one theater with a specified combat force in a combat scenario.

Environment: Theater dependent

Force Composition: Specified by study sponsor and used to generate requirements for Army logistical units.

Scope of Conflict: N/A

Mission Area: Micro FASTALS is a deterministic computer program that was developed to generate the Army support requirements that result from a given combat simulation in a small theater.

Level of Detail of Processes and Entities: Support requirements are generated for each unit type (functional area) including engineer, chemical, medical, transportation, ordnance, quartermaster, et al, by Standard Requirements Code (SRC). The workload requirements needed to sustain the forces are also generated and displayed workloads include maintenance, construction, supply consumption, transportation, patient care, personnel replacements, other.

CONSTRUCTION:

Human Participation: All inputs are developed by functional area analysts prior to model execution. No interaction is permitted during model execution.

Time Processing: Dynamic, one time period

Treatment of Randomness: Deterministic

Sidedness: One sided

LIMITATIONS: Generalized theater network (single region); no time-phasing of requirements; no attrition to combat/support units, single movement of units and supplies from point of arrival in theater to destination.

PLANNED IMPROVEMENTS AND MODIFICATIONS: The model will be expanded to handle 700 units (up from 300) and be able to generate a time-phased troop list similar to the larger FASTALS models.

INPUT: The following data base in magnetic tape form are used. Military Traffic Management Command weights file, Army MARC Maintenance Data Base, Force Accounting System Unit data, and Consumption factor data (provided on floppy disks) from the U.S. Army Logistics Center.

OUTPUT: Force listing is in the form of a troop list indicating unit requirements by SRC.

HARDWARE AND SOFTWARE:
Computer: IBM AT or equivalent
Storage: 1.5 megabytes
Peripherals: Standard or high density disk drives
Language: LOTUS 123
Documentation: User's Manual

GENERAL DATA:
Data Base: One man-week or more depending on size for force and complexity of theater being evaluated.

CPU Time Per Cycle: Five minutes

Data Output Analysis: Two days or more depending upon theater

Frequency of Use: Used approximately 10 time per year for quick reaction analyses

Users: USACAA, U.S. Army Logistics Center, U.S. Army Logistics Evaluation Agency

Comment . This model has been used for 3 years to develop the support force requirements for the Army.

TITLE: Minefields & Barriers Combat Simulation - MBCS

DATE IMPLEMENTED:

MODEL TYPE: Analysis.

PROPONENT: OS1 Department, DRA, Fort Halstead

POINT OF CONTACT: N. Roberts, 0959 532222 ext 2289.

PURPOSE: Research and Evaluation of direct fire and minefield systems effectiveness.

DESCRIPTION:

Domain: Land.

Span: Local (typically up to 10km front)

Environment: Digitized terrain, representing relief, vegetation and man-made cover. 100m resolution.

Force Composition: Heterogeneous direct fire units, and "off-table" artillery.

Scope of Conflict: Conventional.

Mission Area: Any conventional missions within the domain.

Level of Detail of Processes and Entities: Individual vehicles. Detailed representation of direct fire, mines, barriers and artillery. Movement is along preplanned routes at speed governed by local gradient and vehicle performance.

CONSTRUCTION:

Human Participation: None.

Time Processing: Event sequenced.

Treatment of Randomness: Stochastic.

Sidedness: Two-sided, partially symmetric.

LIMITATIONS: No infantry; no C3I.

PLANNED IMPROVEMENTS/MODIFICATIONS: None.

INPUT: Terrain data and preprocessed LOS data; weapon characteristics (range, time of flight); minefield and barrier data (location, row/random, inter-mine spacing or density, mine type, etc); Orbat, deployment, routes, orders; systems data (DF, minefield and artillery lethality).

OUTPUT: Killer/Victim tables, by replication and averaged; mine and artillery kills; detailed event trace.

HARDWARE AND SOFTWARE:
Computer/OS: VAX/VMS
Storage:
Peripherals: None.
Programming Language: FORTRAN 77.
Documentation: Seven volumes, including model definitions, programmers guides, user guide, executive summary.

SECURITY CLASSIFICATION: UNCLASSIFIED.

GENERAL DATA:
Time Required:
Data Preparation: Several weeks.
Preprocessor: Few CPU minutes for most data, plus several hours for LOS.
Simulation: Approx one minute CPU time per minute of battle.
Analysis Package: Minimal. NB Timings are based on a complex main defensive action scenario.

Frequency of Use: Not in use.

Users: OS1 Department DRA.

Comments: The complex series of preprocessors used by MBCS (especially the requirement to preprocess all Lines of Sight) make MBCS rather difficult to use.

TITLE: Network Assessment Model (NAM)

DATE IMPLEMENTED: 11/15/90

MODEL TYPE: ANALYSIS

PROPONENT: U.S. Army Signal Center, Directorate of Combat Developments, Concepts & Studies Division, ATIN : ATZH-CDC (Studies Branch), Fort Gordon, GA 30905-5090

POINT OF CONTACT: Commander, U.S. Army Signal Center, ATIN: ATZH-CDC (CPT A. Tabler), Fort Gordon, GA 30905-5090 DSN 780-3782 COM 404-791-3782

PURPOSE: The Network Assessment Model (NAM) is a high-resolution tactical communications simulation for the combat developer. NAM allows the analyst to simulate the deployment of C4 equipment and communicators via a digitized terrain map, design single and multichannel radio networks, and evaluate network performance against known communications requirements. NAM's flexible design supports the analysis of communications issues including network architectures, current/new doctrine, equipment trade-off, equipment reduction, terrain evaluation, and force design (TO&E).

DESCRIPTION: NAM simulates the performance of the Army's current and planned tactical communications systems: Mobile Subscriber Equipment, SINCGARS, IHFR, JTIDS, EPLRS, TRI-TAC (EAC-CIP). NAM emulates the generation and completion of calls between battlefield users throughout all Battlefield Functional Areas (BFAs).
NAM handles a wide variety of scenario resolutions. Via roll-up techniques, a single instrument or an entire Division can act as the smallest entity. Typically, a Division- or Corps-level scenario is modeled with phone/radio/Battlefield Automated System instrument pools called Operational Facilities (OPFACs) forming the smallest entity.
NAM uses Defense Mapping Agency (DMA) DFAD level-1 or DTED digitized terrain data coupled with the Terrain Integrated Rough-Earth Model (TIREM) propagation algorithn to evaluate radio link performance between 2MHz and 20GHz. NAM computes the effects of Red jammers, terrain and distance that reduce or elimate radio link throughput.
NAM simulates both air and ground communicators. NAM normally models Army-only units. NAM can also model joint and allied users interfacing with Army networks if customized OPFACs and associated needlines are built.
NAM has been developed in a modular format. As new communications systems are proposed, a corresponding module can be inserted.

CONSTRUCTION: NAM emulates the decisionmaking process the Signal Planner employs in supporting Theater-and-below battlefield communicators. Using a menu/mouse-driven interface, the analyst deploys Operational Facilities (OPFACs) that describe the tactical clustering of C4 users and equipment. After the networks linking these OPFACs have been engineered, the traffic offered to the network by the OPFACs' subscribers is generated and subsequently evaluated, resulting in 16 types of call failure/success codes.
NAM has five major modules. MAINTENANCE supports the building and modifying of the OPFAC library, and the extraction of communications needlines. SIMBUILD facilitates Blue OPFAC laydown, network engineering, and Threat EW deployment. SIMRUN schedules, routes, and evaluates the the networks' throughput. TACTICAL SITUATION DISPLAY graphically portrays the networks' performance over time. POSTSIM displays summary statistics.
NAM is a two-sided, asymetric model in that only the Red EW is portrayed.

Most interactive works involves OPFAC laydown. The analyst can stop, adjust, and re-start the scenario to account for the physical destruction or degradation of signal nodes and OPFACs.
NAM's primary engine is a dynamic, event-step call scheduler. Calling rates are based on frequency of transmission values described in the Communications Data Base (CDB) needlines. A negative exponential distribution provides the scheduling for the calls to be initiated and evaluated.

LIMITATIONS: 5000 DNVTs, 2000 OPFACs, 500 MSE Nodes, 100 SINGCARS Nets. Other limits are hardware dependant. Nodal/OPFAC physical attrition is not portrayed. NAM's TIREM implementation does not account for foliage effects.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Planned enhancements include: upgraded EPLRS module with NCS and intercommunity portrayal, the ability to bulk load scenarios, revised threat display, EMC/co-site interference.

INPUT: OPFAC locations (type and quantity of C4 equipment), CDB needlines describing amount and type of transmissions between communicators, Communications backbone and extension node locations, communications equipment characteristics (power settings, antenna heights, sensitivity, data rates, precedence, trunk capacity, etc.) , BAS characteristics (data rate, auto baud detect), DMA digitized terrain.

OUTPUT: Call completion logs, call routing logs, communications node and activity level logs are generated. These logs can be processed by POSTSIM and Tactical Situation Display (TSD) which then graphically display the performance of the network(s) under evaluation. Color graphics include bar charts, pie charts and maps with network diagram and throughput/ channel occupancy overlayed.

HARDWARE AND SOFTWARE:

COMPUTER (OS): Silicon Graphics Inc. (SGI) 4D-series Graphics Workstations' Unix System V (IRIX).

STORAGE: Memory : 8 MB RAM Disk Storage: 17 MB executable code and (min) 10 MB for OPFAC, CDB, DMA terrain files, NAM input files.

PERIPHERALS: RGB Video Printer (Optional). Relational Data Base Management Software (RDBMS) package (Optional-highly recommended).

PROGRAMMING LANGUAGE: C+ with SGI-specific graphics extensions

DOCUMENTATION: Executive Summary, Methodology Manual, User Handbook, Program Maintenance Manual

OTHER COMMENTS: The simulation input module also runs on the SGI 3000-series workstations, but is limited in capacity and processing speed.

SECURITY CLASSIFICATION: Unclassified

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: Preparation is scenario dependant. Turnaround time greatly reduced if end-users provide detailed scenario inputs: units, locations

CPU TIME PER CYCLE: Dependent on number of networks and nodes deployed. For a Division-level scenario, 1 hour simulated time = 5 minutes CPU time.

DATA OUTPUT ANALYSIS: With an RDBMS package, call logs and other

output files can be tied to input for many follow-on investigations

FREQUENCY OF USE: Scenario dependant.

USERS: The Signal Center is the primary user. However, copies of NAM software have been sent to other DoD groups for their evaluation.

COMMENTS: Model turnaround time is extremely dependant on the amount of high-resolution input data provided by the end-user. To improve turn-around the end-user should have a troop list with units (SRCs) and Operational Facilities (OPFACs) already found in the CDB and NAM's customized OPFAC Library. Preparation time increases if customized OPFACs and needlines have to be created.

TITLE: Nuclear Fire Planning and Assessment Model III (NUFAM III)

DATE IMPLEMENTED: 1986

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Mr. R. Barrett, (DSN) 295-1655 or (301) 295-1655

PURPOSE: Research and evaluation tool for corps and theater-level analysis. Used to support requirements and capability assessment studies of theater nuclear forces arrayed in context of a theater battle.

DESCRIPTION:

Domain: U.S. and opposing land and air forces on a corps-sized frontage. Depth to 500 km from FLOT.

Span: Corps level model is routinely run for multiple corps to yield theater-level results.

Environment: User defines unit locations to model based on terrain, posture and scenario. Model does not represent terrain features. Population centers are included for civilian damage/casualty avoidance.

Force Composition: Unit sizes are defined in data base. Intended for company or battalion representation of units. Both Red and Blue units represented.

Scope of Conflict: Nuclear only. Models one or more nuclear pulses occurring within a short period of time (12 hr). Unit locations remain fixed, although the effect of movement is implicitly represented. No conventional attrition occurs during simulation, but should be reflected in unit strength prior to nuclear use.

Mission Area: Nuclear only

Level of Detail of Processes and Entities:

Entities: Company or battalion maneuver unit; artillery and missiles by firing section or launcher, aircraft by sorties from airbases. Defined in data base.

Processes: Target acquisition, detailed fire planning, execution of nuclear pulses, assessment of damage to units. Movement implicitly represented. Damage represented is radiation to personnel and blast to equipment. No fallout. Weapons and effects are defined through data base to allow new weapons to be represented. Fire planning criteria defined through data base to

allow for variations in fire doctrine.

Time: Discrete event driven model

CONSTRUCTION:
Human Participation: Not required outside of preparation of input data

Time Processing: Dynamic event step

Treatment of Randomness: Stochastic (Monte Carlo). Ten runs are normally required to yield reasonable means.

Sidedness: Two-sided, symmetric in logic, asymmetric in data output values and data driven doctrine.

LIMITATIONS: No conventional or chemical play. No explicit movement of units.

INPUT: Unit locations and characteristics; nuclear weapons characteristics and effects. Parameters defining acquisition, movement, and fire planning logic. Size and location of population centers.

OUTPUT: Post-processor produces 30 reports. Typical results are units acquired, engaged, and defeated; weapons selected and fired.

HARDWARE AND SOFTWARE:
Computer: UNISYS 1100/84
Storage: 230K (main); 140K (extended)
Peripherals: Calcomp plotter
Programming Language: SIMSCRIPT II.5
Documentation:
- CAA-D-86-2, NUFAM III User's Manual
- DTIC AD#B113173L

SECURITY CLASSIFICATION: UNCLASSIFIED without data

GENERAL DATA:
Data Base: Data base prep: 1 - 6 weeks depending on number of excursions, etc

CPU Time Per Cycle: Two-hours per repetition; 20-hours per excursion

Data Output Analysis: Currently can produce up to 30 pre-defined reports. Post-processor package (NUFAM-GAP) allows free-form data base queries and graphic displays.

Frequency of Use: Supports 1 to 5 studies/year

Users: U.S. Army Concepts Analysis Agency

Comments: None

TITLE: OPALS DATE IMPLEMENTED: 1990

MODEL TYPE: Training and Education.

PROPONENT: Australian Army War Game Centre.

POINT OF CONTACT: Project Leader AWGC 62-2-9604411.

PURPOSE:
Analytical: Yes.

1. Research & Evaluation
   a. Weapons Systems
      Systems Development?
      Systems Effectiveness?
   b. Force Capability and Requirements
      Courses of Action Assessment?
      Mix?
      Effectiveness?
      Resource Planning
   c. Combat Development
      Current or New Doctrine? To be developed
      Competing Strategies? To be developed
      Policy Study? To be developed

2. Operation Support Tool (Decision Aid)
   a. Skills Development
      Team? Yes
      Individual? Yes
   b. Exercise Driver
      Field Training Exercise Driver? No
      Command Post Exercise Driver? Yes
      Individual Exercise Driver? No

DESCRIPTION:
Domain: Land.

Span: Regional.

Environment: Day or night all weather.

Force Composition: Joint and combined forces (Blue and Red).

Scope of Conflict: Conventional warfare.

Mission Area: All conventional missions using conventional weapons.

LEVEL OF DETAIL OF PROCESS AND ENTITIES:
Entity: Brigade up to Corp.
Process: Attrition, generation of casualties (battle and non battle), movement, consumption of all classes of supply, repair and recovery, resupply, casualty treatment and evacuation, ammunition and fuel usage.

CONSTRUCTION:

Human Participation:

(1) Required:
  (a) For Decisions? Yes
  (b) For Process? No
  (c) For Both?

(2) Not Required:
  (a) Interruptable?
  (b) Scheduled Changes?
  (c) Not permitted?

Time Processing:

(1) Dynamic:
  (a) Time Step? Yes
  (b) Event Step? Yes
  (c) Closed Form?

(2) Static:

Treatment of Randomness:

(1) Stochastic:
  (a) Direct Computation? Yes
  (b) Monte Carlo? No

(2) Deterministic:
  (a) Generate a value as a function of an expected value?
  (b) Basically Determ nistic (No randomness)?

Sidedness:

(1) One-sided?

(2) Two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One side non-reactive?
    Both sides reactive? Yes

(3) Greater than two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One or more side non-reactive?
    All sides reactive?

LIMITATIONS: Simulation of naval and air effects, limited to direct effects on land battle. Resolution in simulating low level conflicts.

PLANNED IMPROVEMENTS/MODIFICATIONS: Provision of video map representation. Enhanced screen presentation. More stations, improved LANs, multi-processing, analytical capability.

INPUT: Scenario, weapon characteristics, operation orders/plans, administration orders/plans, road networks, consumption rates. Logistic functional characteristics.

OUTPUT: Printed reports detailing unit status, staff tables, logistic reports and returns.

HARDWARE AND SOFTWARE:
Computer (OS): IBM PC AT MS DOS 3.2; VAX VMS.
Storage: Not assessed for VAX.
Peripherals: Printers and a plotter.
Programming Language: Pascal.
Documentation: Draft.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Data Base: Unknown at this stage.

CPU Time Per Cycle: Not applicable.

Data Output Analysis: Not applicable.

Frequency of Uses: Expected 2 times per year (initially).

Users: Command and Staff College, Command Headquarters.

Comments: Release date 2nd quarter 1990. Provides both real and accelerated time play.

TITLE: PANTHER (PANTHER)

DATE IMPLEMENTED: 11/01/89

MODEL TYPE: Training and Education

PROPONENT: U.S Army Combined Arms Command - Training, ATIN: ATZL-CTS
Ft. Leavenworth, KS 66027

POINT OF CONTACT: MAJ de la Pena, MAJ Velez, CPT Koone DSN 552-3189/3395
ATIN: ATZL-CTS-BB, U.S. Army Combined Arms Command - Traini

PURPOSE: Training and Education. Panther is used to train comanders and staffs on staff coordination in a Low-Intensity Conflict (LIC) environment.

DESCRIPTION:
DOMAIN: Land, air and rivers.
SPAN: Local, tactical level.
ENVIRNONMENT: Any terrain, weather, time or day.
FORCE COMPOSTION: Joint, combined at tactical level.
SCOPE OF CONFLICT: LIC.
MISSION AREA: Panter focuses on the non-lethal aspects of LIC but also models direct and indirect fire, TACAIR, aviation and air defense.
LEVEL OF DETAIL OF PROCESSESS AND ENTITIES:
Panther models down to individual soldier, individual aircraft or piece of equipment. In a combat engagement, model will deplete units by equipment, minitions and personnel (WIA, KIA, MIA; if wounded in action describes wounds). Model processes all civil affairs, PSOPS, combat actions by zones. This provides the basis for changes in popular support of the legitimate government forces.

CONSTRUCTION:
HUMAN PARTICIPATION: Required, waits for decisions.
TIME PROCESSING: Dynamic.
TREATMENT OF RANDOMNESS: Stochastic; Monte Carlo.
SIDEDNESS: Two-sided, asymmetrical.

LIMITATIONS: Board game requires maps blown up to 1:6,250 and 12,500 scale. Controllers determine CA/PSOPS activities. Requires about 1 day to install data base.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Write program in Spanish. Write Battle Board Worksheet in such a way that one worksheet produces one output. Modify software to make system more user friendly.

INPUT:
Scenario, OPORD, order of battle.

OUTPUT:
Computer printouts.

HARDWARE AND SOFTWARE:

COMPUTER (OS): IBM XT/AT MS DOS

STORAGE: 10 MB

PERIPHERALS: High Speed Printer

PROGRAMMING LANGUAGE: Turbo Pascal 5.5.

DOCUMENTATION: Basic Rules, How to Train Manual and Technical Guide.

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 1 day.

CPU TIME PER CYCLE: unknown

DATA OUTPUT ANALYSIS: N/A

FREQUENCY OF USE: As often as desired.

USERS: U.S. Army tactical units, Latin American CGSC and AOC equivalent schools.

TITLE: Proca DATE IMPLEMENTED: 1989-90

MODEL TYPE: Analysis, possibly Training & Education.

PROPONENT: Operational Research and Analysis Establishment, Directorate of Land Operational Research.

POINT OF CONTACT: Daniel U. Thibault, (613) 995-8080.

PURPOSE: Analysis role: Weapon Systems Effectiveness Research & Evaluation Tool Training & Education role: Seminar Exercise Driver Proca is designed to integrate detailed minefield breaching assessment into the Janus computer wargame. It is a controller tool, the Janus-Proca interface being entirely human. Proca supplies an accurate simulation of the minefield breaching per se, while Janus supplies the accurate simulation of the simultaneous direct and indirect fire battle. Although not designed to run alone, Proca could become the core of a full scale standalone minefield breaching training simulation; interest has already been expressed by developers for that particular purpose.

DESCRIPTION:

Domain: Land.

Span: Local.

Environment: Minefield only. Proca can handle several minefields at once, each having its own *reference frame*. Ground relief and features are not modelled.

Force Composition: Breaching column blue or red.

Scope of Conflict: Mines and Countermeasures only.

Mission Area: Minefield breaching only.

Level of Detail of Processes and Entities:

Entities: Tank sub-parts, countermeasure sub-parts, individual mines.

Processes: Explosive Breaching, Mechanical Breaching, Detection, Scatterable Mine Delivery All processes are time-independent transformations except for Mechanical Breaching. In the latter, a described breaching column of vehicles encounters mines in its path in time sequence until the breach is completed or a vehicle suffers a casualty.

CONSTRUCTION:

Human Participation: Required for Decisions (The simulation stops until the player inputs a new command).

Time Processing: Mechanical Breaching is dynamic, event-driven; all other processes are "instantaneous" data base transformations.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: Two-sided, Asymmetric, Both Reactive. The defending player can only react with the addition of Scatterable Mines in between breaching player actions.

LIMITATIONS: This software package was designed as a controller-level "patch" of Janus 4.05. It could also be used as a standalone minefield breaching simulator but would then be somewhat awkward in its interface.

PLANNED IMPROVEMENTS/MODIFICATIONS: Plans for its integration into a full-blown minefield breaching simulator are being discussed. It might also serve as a basis for a new Janus minefield module. Finally, there is a remote possibility of it being developed into a batch processor for minefield, countermeasure, and tactic effectiveness assessment.

INPUT: Mine, Countermeasure, and Vehicle engineering characteristics. Minefields are laid out using a companion software. The user interface is textual, menu-driven.

OUTPUT: Printout of event log, detailing each event and its outcome.

HARDWARE AND SOFTWARE:
Computer: VAX/VMS.
Storage: About 300k of source code. 64k of executables. Master data file around 10k, most minefields data files are in the 10 to 20k range.
Peripherals: One VT100 terminal required. Printer currently hardwired into the code.
Programming Language: Pascal.
Documentation: DLOR Staff Notes 90/1, 90/2, and 90/10.

SECURITY CLASSIFICATION: UNCLASSIFIED, but data base may be classified.

GENERAL DATA:
Data Base: Depends on accessibility.

CPU Time per Cycle: Very little; simulation is interactive.

Data Output Analysis: Inserted into Janus event log.

Frequency of Use: Iron Dragon wargame series.

Users: DLOR. Interest has been expressed by various other Janus users (USA, UK, Australia).

TITLE: Tactical Simulator (TACSIM)

DATE IMPLEMENTED: 09/01/80

MODEL TYPE: Training and Education.

PROPONENT: Joint Tactical Fusion Program Management Office (JTFPMO), Mclean, VA. TRADOC Proponent: CAC-T, Ft Leavenworth, KS

POINT OF CONTACT: Edward N. Sowell, HQ TEXCOM ATTN: ATCT-BA-SDM, FT Hood TX 76544 AV 738-9517; TRADOC POC: Maj Marion, DSN: 552-3180, ATZL-CTS

PURPOSE: To provide an interactive computer-based simulation to support intelligenc and electronic warefare (IEW) system development and testing; command post training exercises (CPX); and evaluations of IEW and command, control and communications (C3) functions. It supports decisions, corps an echelons above corps (EAC) systems evaluation, training and the all-source analysis system/enemy situation correlation element (ASAS/ENSCE) program development.

DESCRIPTION:
DOMAIN: Land and air.
SPAN: Local.
FORCE COMPOSITION: OPFOR equipment signatures detectable by sensors.
SCOPE OF CONFLICT: Conventional war.
MISSION AREAS: Intelligence.

CONSTRUCTION:
HUMAN PARTICIPATION: Human participation required for decisions and processes.
TIME PROCESSING: Dynamic, event stepped.
TREATMENT OF RANDOMNESS: Stochastic, Monte Carlo.
SIDEDNESS: Two-sided, asymmetric.

LIMITATIONS: The resolution of the sensor modeling is not sufficient for sensor trade-off studies.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None

INPUT: OPFOR unit observables, their strengths and deployment.
OPFOR unit locations and preplanned movement.
Operational characteristics of the sensors and tasking.
Operational environment such as weather.

OUTPUT:
The primary output of TACSIM is intelligence reports in standardized format. These reports are of the quality and quantity expected of the communications, electronic and imagery sensors available to a U.S. commander in wartime. Special reports are also provided to assist simulator operators and exercise controllers.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/785, VAX 8250 or VAX 8600.
VMS

STORAGE: 16MB internal memory; 4 disk drives with at least 200 MB each

PERIPHERALS: 3 CRTs and one printer.

PROGRAMMING LANGUAGE: FORTRAN, SALSIM (FORTRAN version of SIMSCRIPT)

DOCUMENTATION: TACSIM Users Manual for Liason Officers and Exercise Controllers; TACSIM Software Description, Vol I-III; TACSIM Operators Manual, Vol I-III; Software User/Operator Manuals (6).

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: 3 months

CPU TIME PER CYCLE: Unknown

DATA OUTPUT ANALYSIS: N/A

FREQUENCY OF USE: Supports training of division and corps CPXs.

COMMENTS: TACSIM is normally run at the sensitive compartmented information (SCI) level of classification which limits its use to SCI facilities.

TITLE: Target Acquisition Fire Support Model - TAFSM

DATE IMPLEMENTED: Circa 1983.

MODEL TYPE: Analysis.

PROPONENT: U. S. Army Field Artillery School, Fort Sill, OK 73503-5600, U. S. Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD 21005-5071

POINT OF CONTACT: U. S. Army Materiel Systems Analysis Activity Attn: AMXSY-GS (L. Blankenbiller), Aberdeen Proving Ground, MD 21005-5071, DSN 298-3810 or (301) 278-3810.

PURPOSE: TAFSM is a damage assessment/weapons effectiveness model used primarily as a Research and Evaluation Tool. It is designed to evaluate competing artillery force structures and operational concepts as well as the effects of weapon systems against various target types.

DESCRIPTION:

Domain: Land and air.

Span: European and S.W. Asian theater; division sized.

Environment: Statistical terrain is used; database reflects terrain interactions (line-of-sight), open/woods environment, time of day (day/night).

Force Composition: Combined forces, Blue and Red.

Scope of Conflict: Conventional weapons.

Mission Area: Primarily indirect fire artillery with modular direct fire ground game.

Level of Detail of Processes and Entities: Unit resolution is a function of range from the FLOT anduser-directed inputs. Maneuver units are usually at platoon level; fire units at platoon or section level. Movement, target acquisition, communications and mission processing activities are explicitly played at the lowest level defined by the user. Damage is assessed against each individual target element. Attributes for weapon systems, ammunition types, fire direction centers and sensors define the systems' capabilities and performance measures used by subroutines which model the systems' operational functions.

CONSTRUCTION:

Human Participation: Not permitted.

Time Processing: Event sequenced, time stepped using dynamic 48 hour scenario.

Treatment of Randomness: Indirect fire kills are assessed stochastically, with Monte Carlo determination of result. The direct fire ground game uses a stochastic Lanchester attrition model.

Sidedness: Two-sided, symmetric.

LIMITATIONS: Fixed movement paths, dirty battlefield not played explicitly, Red artillery decision rules same as Blue, large threat data scenario requirements, extensive scenario development effort required.

PLANNED IMPROVEMENTS/MODIFICATIONS: Refined direct fire ground game. Joint task force missions added. AFATDS fire direction capabilities.

INPUT: Unit locations and movement schedules. Weapon system and sensor characteristics. Munition characteristics. Communications network. Force structure.

OUTPUT: Tabular data: measures of effectiveness- no. systems destroyed, no. of personnel killed, force attrition; measures of performance- fire missions requested/fired, sensor reports, ammunition expenditures, effects per round type and target element, tube failures and attrition, other items from fire direction centers, communications system and resupply.

HARDWARE AND SOFTWARE:
Computer: Digital VAX/VMS 11/785.
Storage: 220K Bytes.
Peripherals: Line printer, magnetic disks and/or tape drives.
Programming Language: FORTRAN 77 dialect XFOR.
Documentation: User and programmer manual. Draft documentation for the direct fire ground game module.

SECURITY CLASSIFICATION: UNCLASSIFIED without database and/or scenario.

GENERAL DATA:
Data Base: Time to make database updates and set up inputs might run as much as two to four weeks.

CPU time per Cycle: Approximately 8-10 hours with minimum acceptable replications and a 48 hour scenario.

Data Output Analysis: Typically a week or more is required.

Frequency of Use: Varies extensively by organization, but is used at least several times per year.

Users: Directorate of Combat Developments, U. S. Army Field Artillery School and Ground Warfare Division, U. S. Army Materiel Systems Analysis Activity.

Comments: None.

RELEASABILITY: Program code is releasable. Some input data are classified SECRET NOFORN and therefore not releasable.

TITLE: TERRA AUSTRALIS DATE IMPLEMENTED: 1985.

MODEL TYPE: Training and Education.

PROPONENT: Australian Army War Game Centre.

POINT OF CONTACT: Project Leader AWGC 62-2-9604411.

PURPOSE:
Analytical:

1. Research & Evaluation
   a. Weapons Systems
      Systems Development?
      Systems Effectiveness?
   b. Force Capability and Requirements
      Courses of Action Assessment?
      Mix?
      Effectiveness?
      Resource Planning
   c. Combat Development
      Current or New Doctrine?
      Competing Strategies?
      Policy Study?

2. Operation Support Tool (Decision Aid)
   a. Skills Development
      Team? Yes
      Individual? No
   b. Exercise Driver
      Field Training Exercise Driver? No
      Command Post Exercise Driver? Yes
      Individual Exercise Driver? No

DESCRIPTION:
Domain: Land.

Span: Theatre.

Environment: Day or night. All weather.

Force Composition: Joint and combined forces. (Red and Blue).

Scope of Conflict: Conventional warfare.

Mission Area: All conventional missions.

LEVEL OF DETAIL OF PROCESS AND ENTITIES:
Entity: Brigade to Corp.
Process: Attrition of personnel and equipment, generation of casualties (both battle and non battle), consumption of classes 1, 3, 5 and others, repair and recovery, resupply, casualty treatment and evacuation, transport and movement.

CONSTRUCTION:

Human Participation:

(1) Required:
  (a) For Decisions? Yes
  (b) For Process? No
  (c) For Both?

(2) Not Required:
  (a) Interruptable?
  (b) Scheduled Changes?
  (c) Not permitted?

Time Processing:

(1) Dynamic:
  (a) Time Step? Yes. 24 hour game turn to 6 hours real time.
  (b) Event Step?
  (c) Closed Form?

(2) Static:

Treatment of Randomness:

(1) Stochastic:
  (a) Direct Computation? Yes
  (b) Monte Carlo? No

(2) Deterministic:
  (a) Generate a value as a function of an expected value?
  (b) Basically Deterministic (No randomness)?

Sidedness:

(1) One-sided?

(2) Two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One side non-reactive?
    Both sides reactive? Yes

(3) Greater than two-sided:
  (a) Symmetric?
  (b) Asymmetric
    One or more side non-reactive?
    All sides reactive?

LIMITATIONS: Only limited Naval and Air effects are modelled.

PLANNED IMPROVEMENTS/MODIFICATIONS: Planned replacement by OPALS.

INPUT: Weapons, attrition tables, characteristics of units, road networks, consumption tables, Logistic functional characteristics.

OUTPUT: Printed reports of staff tables, attrition logistics holdings.

HARDWARE AND SOFTWARE:

Computer (OS): IBM PC/AT with PC Network;MS DOS 3.2.

Storage: 8mb disk for total system. 1.5mb per station.
Peripherals: 132 column printers.
Programming Language: UCSD (PASCAL).
Documentation: Draft.

SECURITY CLASSIFICATION: Restricted.

GENERAL DATA:
Data Base: 2 weeks.

CPU Time Per Cycle: Not applicable.

Data Output Analysis: None.

Frequency of Uses: 1 per year.

Users: Command and General Staff Course.

TITLE: TOW Missile System Simulations DATE IMPLEMENTED: 1978

MODEL TYPE: Analysis

PROPONENT: U.S. Army Materiel Systems Analysis Activity (AMSAA)

POINT OF CONTACT: Director, USAMSAA, ATTN: AMXSY-CS (MR. A. GORDON), Aberdeen Proving Ground, MD 21005-5071
DSN 298-6459 or Comm (301) 278-6459

PURPOSE: A set of research and evaluation tools used during system development and to provide item level performance input to force-on-force models. The TOW Missile Systems Simulations are computerized, analytical models that simulate the in-flight performance of the family of TOW Missile Systems. These simulations are used primarily to compute the accuracy of the TOW Missile Systems using gunner aiming error and target motions as input.

DESCRIPTION: The TOW simulations include 6 degree-of-freedom equations of motion, mathematical models of the guidance equations and uncertainties associated with certain parameters.

Domain: Land, air.

Span: Individual.

Environment: None.

Force Composition: Element.

Scope of Conflict: Any involving guided anti-armor weapons.

Mission Area: Anti-armor.

Level of Detail of Processes and Entities:
Entity: Individual weapon and its mount.
Processes: Probability of hit.

CONSTRUCTION:
Human Participation: Not permitted.

Time Processing: Static.

Treatment of Randomness: Stochastic, Monte Carlo.

Sidedness: One-sided.

LIMITATIONS: One-on-one, no obscuration.

PLANNED IMPROVEMENTS/MODIFICATIONS: None.

INPUT: Gunner Aiming Error; Target Velocity.

OUTPUT: User selectable including means and standard deviations of the missile's position as a function of time.

HARDWARE AND SOFTWARE:
Computer (OS): Cray XMP (UNIX)
Storage required: 32K
Peripherals: None.
Programming Language: FORTRAN
Documentation: AMSAA TR 293, "Simulation and Analysis of the Training Effectiveness Analysis-TOW (TEA-TOW) Flight Data," Patrick E. Corcoran, April 1980.

SECURITY CLASSIFICATION: (Model without data) UNCLASSIFIED.

GENERAL DATA:
Data Base: Available from tests and separate models; about one week depending on scope.

CPU Time per Cycle: 5 seconds.

Data Output Analysis: A few hours.

TITLE: Transportation and Supply Activities (TRANSACT)

DATE IMPLEMENTED: 01/01/82

MODEL TYPE: Analysis

PROPONENT: TRADOC Analysis Command, Ft Lee (TRAC-LEE)
Fort Lee, VA 23801

POINT OF CONTACT: Bruce E. Lasswell, DSN: 539-1816, Fort Lee, VA 23801

PURPOSE: To furnish information on how supply requests may be satisfied under constraints of load/unload capability, vehicle availability, terminal/dock availability, network and enemy attack.

DESCRIPTION: TRANSACT is a physical distribution model created using the MAWLOGS Modeling System. It may be run either stochastically or deterministically. Unit requests are levied on a supply system which assigns loading assets and vehicles to ship supplies over a detailed network. Vehicles may be attacked when halted. The terminals, supply points, and network may also be attacked.

CONSTRUCTION:
HUMAN PARTICIPATION: Not required--scheduled changes.
TIME PROCESSING: Dynamic, event-step.
TREATMENT OF RANDOMNESS: Either stochastic, Monte Carlo or basically deterministic as required by the user.
SIDEDNESS: One-sided.

LIMITATIONS: Requires extensive data input. Not directly related to combat models.

PLANNED IMPROVEMENTS AND MODIFICATIONS: None.

INPUT: Weight and cube of items to be moved, supply support structure and stockage parameters/policy, transportation network discription, supply request schedule, vehicle characteristics and location, scenario such as location and priority of units, and attack schedule.

OUTPUT: Weight and cube of cargo delivered (also number of items by item), items requested, network and vehicle overloads, average and peak wo for each link/terminal, queue buildups for each link/terminal, supply point workloads and supply status by node/class/item, dock and vehicle utilization, BOH at supply units over time, vehicle production in terms of weight and distance, attack results.

HARDWARE AND SOFTWARE:

COMPUTER (OS): VAX 11/780, SUN series.

STORAGE: Variable.

PERIPHERALS: Printer and tape drive.

PROGRAMMING LANGUAGE: FORTRAN 77, FORTRAN IV, GASP IV.

DOCUMENTATION: Users' Guide for LOGATAK II (DLSIE 42543-MC), Programers' Guide for LOGATAK II.

OTHER COMMENTS: TRANSACT was created using the Models of the Army Worldwide Logistics System (MAWLOGS).

SECURITY CLASSIFICATION: Unclassified.

GENERAL DATA AND TIME REQUIREMENTS:

DATABASE: N/A.

CPU TIME PER CYCLE: Varies.

DATA OUTPUT ANALYSIS: One to three weeks.

FREQUENCY OF USE: As needed.

USERS: Proponent and U.S. Army Transportation School.

COMMENTS: Government agencies can obtain TRANSACT with a signed memorandum of agreement. Government contractors with a valid contract requiring the use of TRANSACT can also obtain the model with the approval of the TRAC Commanding General. Inquiries for obtaining the model and supporting data bases should be addressed to TRAC-TOD, Ft. Leavenworth, KS 66027-5200 or call DSN: 552-5511 or commercial 913-684-5511.

TITLE: TRANSMO - Transportation Model Date Implemented: 1973

MODEL TYPE: Analysis

PROPONENT: U.S. Army Concepts Analysis Agency
Attn: Mobilization and Deployment Directorate
8120 Woodmont Avenue
Bethesda, MD 20814-2797

POINT OF CONTACT: Ms. Vera W. Hayes, (301) 295-1583, DSN 295-1583

PURPOSE: TRANSMO is used primarily to analyze strategic deployment issues taken in the context of the Defense Planning Guidance (DPG) Scenario. It specifically simulates the loading of cargo on inter-theater lift vehicles, ultimately resulting in an arrival sequence of cargo (unit equipment, resupply, and personnel) in the theater(s) of operation.

DESCRIPTION:

Domain: Sea and air

Span: Accommodates any theater or theaters depending on data base input

Environment: Availabilities, loading and unloading time of inter-theater lift assets are represented in terms of hundredths of an hour. Port throughput capacities are represented by numbers of lift assets that can be handled at any given time during the simulation.

Force Composition: Movement requirements represent all services, with particular emphasis on Army requirements (data base dependent).

Scope of Conflict: Generally conventional with capability to represent chemical degradation of ports.

Mission Area: Strategic deployment for force capability and planning analysis. Generally represents sea and airlift requirements.

Level of Detail of Processes and Entities: Processes on an hourly basis for aircraft and a daily basis for sealift. Lift assets are represented by their speed and capacity--short tons for airlift and short tons, square feet, and measurement tons for sealift. Movement requirements, which represent a varied level of detail from a division to a UIC or an aggregation of resupply or ammunition requirements, are displayed by their characteristics (bulk, over, outsize cargo for air requirements and short tons, square feet, and measurement tons for sealift requirements). Attrition is based on an expected value; if sea or air assets are in the zone of hazard during the period in which attrition is begin applied, each vessel will be attrited by the expected attrition value in effect. Sealift convoy operations can be simulated.

TRANSMO can be viewed as a model with a flexible level of detail ranging from low to high levels of resolution depending upon the input data.

CONSTRUCTION:
Human Participation: None required.

Time Processing: Dynamic, time and event step

Treatment of Randomness: Sea and air attrition are deterministically assessed based on expected value during a time period.

Sidedness: One-sided

LIMITATIONS: Does not track specific commodities and individual lift assets.

PLANNED IMPROVEMENTS AND MODIFICATIONS: Automatic generation of balanced deployment (combat, combat service, combat service support). Refine airlift and operations. Time phasing of port capacities.

INPUT:
- Scenario data include
  - lift asset availability at POEs
  - asset capacities
  - load and unload times
  - distances between ports
  - predetermined attrition rates
  - port constraints
- Movement requirements include
  - availability at the POE
  - latest arrival date at the POD
  - unit of measurements expressed in terms of short tons, square feet, and measurement tons
  - priority for movement

OUTPUT: Produces printouts of movement requirements; attrition associated with each requirement, and arrival time at the POD. Many other analyst reports are available for review to determine how the deployment was conducted e.g., lift utilization, closure by cargo category, etc.

HARDWARE AND SOFTWARE:
Computer: Designed to run on the UNISYS 1100/84.
Storage: 80,000 blocks (40 MB) for the model only
Peripherals: Minimum requirements: one printer, one VT100 terminal, and one 400K block hard disk
Language: FORTRAN 77
Documentation: User manual with two appendixes. (updated Jul 92)

SECURITY CLASSIFICATION: Unclassified, but data bases are generally classified.